

Environmental Assessment
for
San Bernardino National Wildlife Refuge
Projects
Associated with Mitigation for
Department of Homeland Security
Tactical Infrastructure

Cochise County,
Arizona

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San Bernardino National Wildlife Refuge

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1.0 PURPOSE OF AND NEED FOR PROPOSED ACTION ALTERNATIVE

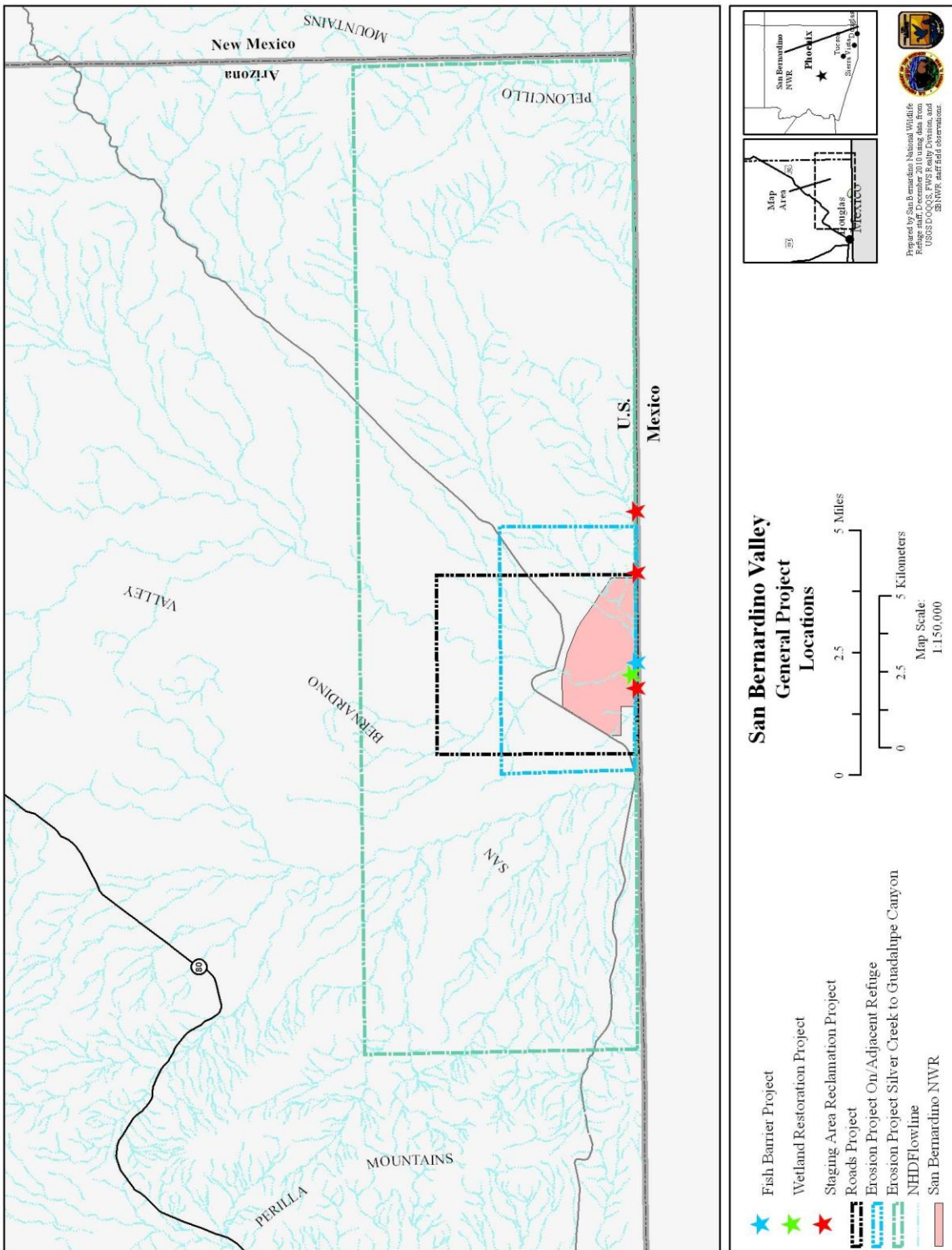
1.1 Introduction

The United States Fish and Wildlife Service (Service) is proposing several habitat restoration projects on and adjacent to San Bernardino National Wildlife Refuge to help correct perceived construction deficiencies resulting from congressionally mandated Department of Homeland Security (DHS) construction of tactical infrastructure through southeastern Arizona's San Bernardino Valley. These proposed projects will help serve to mitigate impacts to seasonal and perennial stream crossings, historical wetlands, and providing vehicle access through previously roadless areas throughout the San Bernardino Valley. Impacts associated with tactical infrastructure construction have: created opportunities for the invasion of exotic aquatic animal species and exotic plant species; have removed connections among populations of federally-listed threatened and endangered species, degrading metapopulation structure; have encouraged severe erosion to wetlands and uplands; and have created opportunities for public access into areas that conflict with endangered species recovery and protection and will perpetuate potential "take" issues. This Environmental Assessment (EA) is being prepared to evaluate the effects associated with this proposal and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (516 DM 8) and Service (550 FW 3) policies (see Section 1.7 for a list of additional regulations that this EA complies with). NEPA requires examination of the effects of proposed actions on the natural and human environment. In the following chapters, two alternatives are described and environmental consequences of each alternative are analyzed.

1.2 Location

The San Bernardino Valley watershed lies in extreme southeastern Arizona, and includes the 2,369-acre San Bernardino National Wildlife Refuge (SBNWR) in Cochise County. While this watershed straddles the international border between Arizona and Sonora, Mexico, the projects proposed in this EA will occur only in the United States. The refuge was set aside in 1982 to protect and recover populations of multiple federally listed threatened and endangered species. Habitat conservation, protection, and restoration on SBNWR and in the surrounding area are major factors in the continued existence of all of these species.

Figure 1.2 San Bernardino Valley showing general project locations



1.3 Background

Since 1892, the international border separating Arizona and Sonora in the San Bernardino Valley has been marked by monuments erected by government surveyors and has additionally been delineated by an 8-strand barbed wire “legacy fence” built in the 1940’s. This fence was installed primarily to prevent livestock from moving freely between the United States and Mexico, and has done little to restrict the movement of wildlife, vehicles, or people. Some portions of the barbed wire fence were constructed within a few feet of the international border, while other portions were built 60-feet north of the actual border. Many portions of the barbed wire fence were broken or even missing by 2006.

Under the Secure Fence Act of 2006, DHS was mandated to build up to 700 miles of fencing along the 2,000-mile Southwest border of the United States to promote national security. This “new” fencing was to be composed of various styles of pedestrian and vehicle barriers designed to stop a 10,000-pound vehicle traveling 40 mph. The Border Patrol was given a very specific national security mandate and a very specific timeframe in which to meet that mandate. This action placed the DHS mission in potential conflict with several Department of the Interior (DOI) environmental and cultural resource missions. Additionally, DOI legal obligations did not necessarily mesh with DHS legal obligations, and it was apparent that the two Departments would need to coordinate activities to avoid conflicts.

Largely because of concerns that potential conflicts in government missions would delay the proposed national security project, DHS officials invoked a waiver under the Real ID Act on April 1, 2008 to expedite construction of border security infrastructure along the southwest border of the United States. Included in these waivers were a total of 37 environmental laws and DOI authorities associated with the administration of lands and programs. Some of these authorities included the National Environmental Policy Act, the Endangered Species Act, the National Wildlife Refuge System Administration Act, the Migratory Bird Treaty Act, the Archeological Resources Preservation Act, and the Clean Water Act. However, with or without the waiver, DHS officials stated that they were committed to working with SBNWR personnel to minimize disturbance to the refuge, to protect the environment, and to protect endangered species.

DHS ultimately constructed an all-weather road and a vehicle barrier along the international border through almost the entire San Bernardino Valley nearly to the New Mexico state line. This tactical infrastructure is located largely within the 60-foot strip of land immediately adjacent to the international border known as the “Roosevelt Reservation,” set aside by presidential proclamation in 1907 as an easement to help enable border security. Several miles of additional all-weather access roads were constructed to enable efficient access to tactical infrastructure within the easement. DHS tactical infrastructure does help promote national security and can help reverse the adverse environmental effects of illegal border activities. However, the construction, operation, and maintenance of the tactical infrastructure also inherently created some adverse impacts to the environment, such as erosion and habitat fragmentation. Additionally, easier access for pot hunters and loss of these resources due to altered water drainage patterns, impact cultural resources. Construction of the tactical infrastructure will perpetuate environmental impacts well into the future. Some of these threats include accelerated sedimentation of streams and wetland sites, increased establishment of non-

native plant species, and loss of native wildlife species and their habitats. Recognizing this, DHS officials engaged with federal and state resources management agencies to identify natural, biological, and cultural resources potentially affected by tactical infrastructure construction, and collaborated to identify ways to reduce and mitigate the impacts.

Erosion control measures and subsequent groundwater recharge on SBNWR have improved since 1982, increasing the volume of perennial water on both sides of the international border in Black Draw, and providing the stream with greater amounts of water and longer periods of flow each year. This sustained flow helps support a diversity of native fish, wildlife, and plants, and is leading to the self-perpetuation and recovery of native fish populations. However, the increased flow also allows longer, more viable connections with perennial wetlands located downstream in Mexico. This connectivity of wetlands potentially allows invasion of non-native aquatic species onto SBNWR. Exotic fish species known to occur in the watershed south of SBNWR include the Western mosquitofish, black bullhead, channel catfish, carp, largemouth bass, and black crappie. The only viable direction for recovery of native fish is segregation of native from non-native fish (Clarkson and Marsh 2008), and a barrier seems to be the best available option for achieving such segregation.

Other than mostly ephemeral stream channels, the historic San Bernardino Ciénega is the most extensive wetland in the region, and forms an important migratory link between mesic environments in the Sierra Madre Occidental with those further to the north. It supports a unique and endemic biota, varying from special vertebrates to invertebrates and plants, including rare species and several federally listed threatened and endangered species. The ciénega was well watered in the past, extending from SBNWR in Arizona south for 1.6-miles across the international border into Sonora, Mexico. It is currently reduced to remnants associated with artesian wells, springs, and artificial ponds. Even in its degraded state it remains an oasis within these otherwise arid lands. Tactical infrastructure was constructed by DHS across the entire San Bernardino Valley, bisecting the ciénega and impeding sheetflow drainage of the historic wetland because the infrastructure was built across the historical wetland. The project is supported by the San Bernardino and Leslie Canyon National Wildlife Refuges Comprehensive Management Plan, which identifies management of productive wetland habitats as crucial to the perpetuation of biodiversity and species richness within the area.

Following the establishment of SBNWR, wetland and grassland habitats in the Black Draw and Hay Hollow watersheds have been enhanced over time by the FWS through a variety of cooperative management activities focused on halting and preventing stream head-cutting, providing increased soil saturation and infiltration, and promoting healthy riparian corridors and grasslands. Such long-term habitat enhancement work required the initial installation of erosion control structures followed by regular repair of these structures to maximize their effectiveness in helping hold soil moisture. Ultimately, improved shallow aquifer conditions and regeneration or riparian vegetation provided further system stabilization.

The erosion control measure project will help mitigate for some of the DHS tactical infrastructure in the San Bernardino Valley that was engineered and constructed with inadequate drainage, negatively affecting the natural flow of precipitation runoff within the watershed supporting SBNWR and carrying loose sediment from the roads into natural drainages that feed

wetlands supporting populations of federally listed species. The project will also help mitigate damages resulting from construction of AR-6, a “temporary” access road built upstream from SBNWR across Hay Hollow Wash by DHS, coupled with tons of debris discarded upstream from SBNWR in Hay Hollow Wash from a concrete production facility (much of which has subsequently been mechanically removed) that are poised to negatively impact soil and water quality in the watershed on a continual basis. A major concern is that soil erosion, sedimentation, and potential contaminant problems will affect water quality if transported into aquatic environments on SBNWR or elsewhere.

Many of the private roads adjacent to SBNWR have yet to be converted to all-weather roads and these roads cross or are upstream from tributaries to Black Draw and Hay Hollow Wash. Border Patrol, in executing their duties, uses many of these roads, causing the possibility of increased sedimentation into the watersheds. In addition, existing dirt administrative roadways on SBNWR have been used since establishment of the refuge by FWS employees to help cost effectively conduct operations and maintenance activities associated with public use, law enforcement, biological inventory and monitoring, research, construction, and facility management. SBNWR has been systematically converting these roads to all-weather material, but does not have the necessary funding to maintain or complete the project, leading the increased soil loss and sedimentation.

Hydroseeding of staging areas was accomplished by DHS contractors and may have had some positive effects. However, the hydroseeding action also inoculated some of the staging areas with non-native vegetation. This mitigation project will enhance the long-term viability and integrity of wetland and upland habitats by helping remove and control the density and spread of non-native vegetation that can become invasive and dominate the landscape.

The hydrological relationship between House Pond, Tule Spring, Snail Spring, and additional associated wetlands has not been accurately determined; however, it appears that the wetlands have influences upon each other even though they appear to be fed by separate aquifers in some instances. Snail Spring, located on Slaughter Ranch (Johnson Historical Museum of the Southwest) adjacent to SBNWR, is the Type Locality for the endemic San Bernardino springsnail. This species, under FWS consideration for emergency listing, is now separated from adjacent springsnail metapopulations by DHS tactical infrastructure and does not have the appropriate water quality and quantity to support a viable population. Under a Warranty Deed, the FWS holds a conservation easement on this property, which provides the Service the opportunity to perpetually manage the water and other wildlife resources on the property specifically for threatened and endangered species.

A mixture of land ownerships occurs in the San Bernardino Valley, including private properties, state trust land, and land under federal ownership. The area has a long history of human occupation and corresponding landscape modifications have occurred. In recent decades, landowners have identified various opportunities to improve watershed health, and have systematically been performing a variety of projects to reverse much of the degradation that was previously imposed upon the landscape. Recent land management activities have focused on halting and preventing stream head-cutting, providing increased soil saturation and infiltration,

and promoting healthy riparian corridors and grasslands. The Bureau of Land Management (BLM) has helped establish watershed health assessments within portions of the San Bernardino Valley landscape and established priorities for watershed restoration that provide a framework for the kinds of erosion control projects that can be broadly implemented across the entire Valley.

1.4 Purpose of Action

The purpose for which this EA is being prepared is to implement the proposed mitigation projects in the San Bernardino Valley on and adjacent to SBNWR to help compensate for adverse impacts to environmental resources caused and anticipated by tactical infrastructure constructed under the authority of DHS for the purpose of national security along the southwest border of the United States.

DHS officials suggested cooperating with DOI to identify site-specific solutions for potential problems created by the infrastructure, and stated they will fund a total of \$50 million over a ten-year period for compensation and mitigation projects to be split among California, Arizona, New Mexico, and Texas. During December 2008, various DOI personnel, including SBNWR staff, provided several project proposals that would potentially qualify for a portion of this mitigation money. These included the following projects, which were ultimately submitted by DOI to DHS for consideration: 1) Construction of a fish barrier on SBNWR in Black Draw to prevent the upstream movement of non-native fish species; 2) Restoration of about 50-acres of wetlands on SBNWR within the historic San Bernardino Ciénega to provide wetland habitat for a significant number and diversity of fish and wildlife; 3) Construction of multiple erosion control structures within the Black Draw and Hay Hollow Wash watersheds on and adjacent to SBNWR to catch water-borne sediments being transported by flood events and effectively help re-build the floodplain and restore groundwater recharge; 4) Upgrade up to ten miles of existing dirt roadways on and adjacent to SBNWR with adequate base coarse material and culverts to enable all-weather vehicle travel while preventing sediment transport into adjacent wetlands. Refuge administrative use of some refuge areas have been cut off or otherwise altered by installation of DHS infrastructure. All-weather roadways will provide the FWS the necessary vehicle access to enable security, protection, and management to multiple endangered species, and will facilitate safer access for first responders during potential emergencies. 5) Where it is appropriate, remove accumulated construction debris “mulch” previously deposited on tactical infrastructure staging areas, and consider reapplication of native seed. 6) Drill two separate wells on and adjacent to SBNWR, one tapping the deep aquifer and one tapping the shallow aquifer, to ensure adequate water quantity and appropriate water quality for federally-listed species and for the endemic San Bernardino springsnail (currently proposed for emergency listing). 7) Control off-refuge erosion within the San Bernardino Valley at locations that will improve downstream wetland habitat. These mitigation projects demonstrate some of the positive approaches and solutions available to reconcile national security and environmental objectives along the international border.

1.5 Need for Action

In some areas, the tactical infrastructure constructed for national security can impede the otherwise natural flow of water across the international border during precipitation events,

increase water depths during floods, and accelerate stream channel erosion in sensitive riparian areas. Vegetative debris carried by floodwaters can be trapped against the vehicle barrier and impede or redirect flow. Lateral flow of floodwater can cause environmental damage, damage roads, and increase siltation in the Río Yaqui watershed, which can negatively impact federally listed threatened and endangered fish and other species. The resulting soil erosion and sedimentation can affect water quality if it is transported into aquatic environments. Increased sedimentation can reduce water clarity, destroy benthic food sources, damage fish spawning sites, and lead to unnatural stream aggradation. Fine sediments in wetlands can reduce oxygen availability to fish eggs and increase embryo mortality, can impact the function of gills in fish and other aquatic organisms, and can ultimately cause suffocation. Additionally, the functionality of wildlife corridors and protected areas can be negatively affected by tactical infrastructure.

Much of the DHS tactical infrastructure is designed so that the natural flow of water will not be significantly impeded, and multiple drainage improvement projects have been constructed by DHS to minimize soil erosion and resulting sedimentation. A substantial bridge was constructed by DHS across Black Draw, the headwaters of the Rio San Bernardino, to provide vehicular access along the international border while also minimizing negative impacts to the perennial stream. Additionally, DHS contractors are scheduled to remove accumulated vegetative debris from barriers so that backwater flooding and lateral water flows will not be enhanced. However, not all of the foreseeable environmental impacts related to the DHS mandate of maintaining national security could be minimized or eliminated, and DHS officials recognized that mitigation was the most efficient and cost effective way to help compensate for some of the negative environmental impacts resulting from tactical infrastructure installation.

Among other conditions, the Rio Yaqui Fishes Recovery Plan (USFWS 1994) recommends the following conditions before down-listing of federally-listed threatened and endangered species can be considered: “Secure and protect the San Bernardino aquifer so that all artesian flows maintain themselves year round, and protect critical habitat from detrimental human disturbance including introduction of non-native fishes and water diversions.”

With the threat of anthropomorphic influences and long-term drought impacting wetlands and associated plant and animal metapopulations, it is important that crucial corridors that interconnect populations of rare species will be protected and enhanced, along with the fish and wildlife populations that they support. This project is important to both the short term and long-term conservation of all the target species.

The erosion control projects will help mitigate for some of the DHS tactical infrastructure in the San Bernardino Valley that was engineered and constructed with inadequate drainage, negatively affecting the natural flow of precipitation runoff within the watershed and carrying loose sediment from the roads into natural drainages that ultimately feed downstream wetlands supporting populations of federally listed species. A major concern is that soil erosion, sedimentation, and potential contaminant problems will affect water quality if transported into downstream aquatic environments within the watershed. Increased sedimentation can reduce water clarity, destroy benthic food sources, damage fish spawning sites, and lead to unnatural stream aggradation. Fine sediments in wetlands can reduce oxygen availability to fish eggs and

increase embryo mortality, can impact the function of gills in fish and other aquatic organisms, and can ultimately cause suffocation and death. These site-specific projects will help accelerate fish and wildlife habitat restoration processes within the San Bernardino Valley landscape by enhancing important wetlands, grasslands, and wildlife corridors.

1.6 Decision to be Made

The scope of the analysis in this EA covers the direct, indirect, and cumulative environmental effects of implementing mitigation measures developed to compensate for potentially adverse environmental consequences related to the Congressionally mandated construction of DHS tactical infrastructure. The decision to be made concerns which alternative to implement and whether the alternative to be implemented will have a significant impact over the existing environment.

1.7 Regulatory Compliance

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System (NWRS), the purposes of an individual refuge, Service policy, and laws and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, Refuge Recreation Act of 1962, and selected portions of the Code of Federal Regulations and Fish and Wildlife Service Manual.

The mission of the Refuge System is:

“... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans” (National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57).

The goals of the Refuge System are to:

- *Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered;*
- *develop and maintain a network of habitats for migratory birds, anadromous and interjurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges;*
- *conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts;*
- *provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation); and*
- *foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.*

San Bernardino NWR was established on April 1, 1982 under authority of the Endangered Species Act of 1973 and the Fish and Wildlife Act of 1956 in order to “...conserve fish or wildlife which are listed as endangered species or threatened species...or plants.” These species include the Yaqui chub (*Gila purpurea*), Yaqui topminnow (*Poeciliopsis sonoriensis*), Yaqui catfish (*Ictalurus pricei*), Yaqui beautiful shiner (*Cyprinella formosa*), Chiricahua leopard frog (*Lithobates chiricahuensis*), and Huachuca water umbel (*Lilaeopsis schaffneriana*). Critical habitat is established on the refuge for the Yaqui chub, Yaqui catfish, and Yaqui beautiful shiner, and includes all aquatic habitats on SBNWR. Many additional fish, wildlife, invertebrate, and plant species occur on the refuge and are supported by associated upland, wetland, and riparian habitats.

This EA was prepared by the Service and represents compliance with applicable Federal statutes, regulations, Executive Orders, and other compliance documents, including the following:

- Administrative Procedures Act (5 U.S.C. 551-559, 701-706, and 801-808) as Amended
- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Antiquities Act of 1906 (16 U.S.C. 431-433)
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Bald Eagle Protection Act (16 U.S.C. 668-668d) as amended
- Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq.*)
- Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq.*)
- Endangered Species Act of 1973, (ESA) as amended (16 U.S.C. 1531 *et seq.*)
- Executive Order 12898, Federal Action Alternatives to Address Environmental Justice in Minority Populations and Low Income Populations, 1994.
- Executive Order 13112, Invasive Species (issued in February 1999)
- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 *et seq.*)
- Fish and Wildlife Improvement Act of 1978 (16 U.S.C. 7421)
- Floodplain Management (Executive Order 11988)
- Migratory Bird Treaty Act (16 U.S.C. 703-712) as amended
- National Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee) as amended
- The National Wildlife Refuge System Improvement Act of 1997 (P
- National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 *et seq.*)
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq.*)
- National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 *et seq.*)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq.*)
- Protection and Enhancement of the Cultural Environment (Executive Order 11593)
- Protection of Wetlands (Executive Order 11990)
- National Pollutant Discharge Elimination System, as amended (33 U.S.C. 1251 *et seq.*)
- Soil and Water Conservation Act of 1977 (16 U.S.C. 2001-2009) as amended

Further, this EA reflects compliance with applicable State of Arizona and local regulations, statutes, policies, and standards for conserving the environment and environmental resources such as water and air quality, endangered plants and animals, and cultural resources.

1.8 Issues, Scoping, and Public Involvement

This EA covers a large geographic area and has the possibility to affect many stakeholders in the San Bernardino Valley. Many of the issues that this EA looks to address for the Refuge can also have an effect on many of the private landowners in the San Bernardino Valley. Erosion being one of the most prevalent because of its many impacts to the landscape and a part of many of the mitigation projects discussed in this EA. DHS's tactical infrastructure construction had the greatest impact on drainage within the valley, which could lead to increased erosion or erosion in areas previously unaffected by it. Another issue facing land managers in the San Bernardino Valley because of the construction by DHS is the possibility of increased non-native plant species diminishing available forage for wildlife and cattle.

Scoping is an early and open process for determining the scope of the issues to be address. The FWS prepared a News Release entitled "Wildlife Refuge Seeks Public Input on Proposed Mitigation Project" that was submitted to local newspapers for a two-week comment period beginning February 5, 2011 and closing February 19, 2011. No comments were received from the public during this scoping period, and one email comment was received from a Federal agency, the Bureau of Land Management, which resulted in an associated follow-up phone conversation on February 14, 2011 during this scoping period. The BLM contacted the FWS during the scoping period and recommended adding a component to this EA that would also include the construction of off-refuge erosion control projects within the San Bernardino Valley landscape located between Guadalupe Canyon and its tributaries to the east and Silver Creek and its tributaries to the west. This suggestion was therefore included as section (g) in the following alternatives.

2.0 ALTERNATIVES

2.1 Alternative A--No Action Alternative

Under the No Action Alternative, current management direction would continue. All of the negative impacts associated with DHS tactical infrastructure construction deficiencies will continue to negatively influence the San Bernardino Valley landscape and the refuge purpose of endangered species protection and recovery. The need for action identified in this EA would not be satisfied.

a) Fish Barrier

Under this alternative, the Service or a contractor of the Service, will not construct a concrete fish barrier on SBNWR in Black Draw near the Mexican border. Without a barrier to prevent the upstream movement of non-native fish species, these exotic species from Mexico will be allowed to compete directly (through predation) and indirectly (by eating the same food and using the same water and dissolved oxygen) with protected species and will undo many of the recovery

efforts already achieved on SBNWR, which has otherwise eliminated all non-native fish through various management actions undertaken during the history of the refuge.

b) Wetland Restoration

By choosing this alternative, the Service will be unable to restore wetlands on SBNWR within the historic San Bernardino Ciénega or will be significantly delayed in those restorations. There will be no additional wetlands to mitigate for those wetlands lost or altered due to the construction of DHS tactical infrastructure.

c) Erosion Control Measures

The construction of multiple rock and wire erosion control gabions within the Black Draw and Hay Hollow Wash watersheds on and adjacent to SBNWR would not be carried out by the Service or would be delayed. Some of the DHS tactical infrastructure in the San Bernardino Valley was engineered and constructed with inadequate drainage, which affects the natural flow of precipitation runoff within the watershed supporting SBNWR, currently inhibiting and redirecting natural drainage and carries loose sediment from the road erosion into wetlands that support federally listed species.

d) All-weather Roads

Under this alternative, upgrading up to ten miles of existing dirt roadways by the Service, on and adjacent to SBNWR with adequate base coarse material and culverts to enable all-weather vehicle travel would not occur or would be delayed. Currently, the use of dirt roadways by vehicles accelerates erosion of fragile hydric soil types characteristic of the refuge, increasing the potential for soil particles to become airborne during dry periods (affecting air quality, vegetation transpiration, and pollination) and increasing sedimentation of streams and other wetlands during precipitation events (affecting oxygen availability, fish spawning, and gill function). Use of dirt roadways during muddy periods increases the potential for road rutting, damaging refuge infrastructure and providing additional ideal breeding sites for mosquitoes that transmit various diseases to wildlife and humans. Increased sedimentation damages aquatic habitats by covering fish spawning sites, destroying benthic food sources, and reducing water clarity. Fine sediments reduce availability of oxygen to fish and amphibian eggs and increases embryo mortality. Fine sediments also cover and clog the gills of fish and other aquatic organisms, making breathing difficult. Input of additional sediments from dirt roadways into wetlands also leads to stream aggradation.

e) Reclamation of Construction Staging Areas

The Service will not remove the accumulated construction debris that was ground into “mulch” by DHS contractors and then spread onto multiple tactical infrastructure staging areas in the San Bernardino Valley before being hydroseeded. The reapplication of native seed will not occur or will be delayed. These “restored staging areas” are currently composed of concentrated exotic plant species, are located along the newly constructed DHS border road traversing the San

Bernardino Valley, and in some cases are located immediately adjacent and upwind from SBNWR. A lack of immediate, dedicated eradication and exclusion of noxious and invasive non-native plant species will not enable SBNWR to properly manage and perpetuate upland and wetland habitats crucial to endangered species recovery.

f) Water Wells

The drilling of two separate wells on and adjacent to SBNWR by the Service or its contractors, will not occur or would be delayed. Populations of Yaqui catfish, Yaqui chub, and Yaqui topminnow will be at risk. Snail Spring, located at the Johnson Historical Museum of the Southwest adjacent to SBNWR, is now cut off from the springsnail population in Mexico by interruption of spring flow from DHS tactical infrastructure. The free-flowing springrun at Snail Spring is already at risk because it is separated from adjacent snail metapopulations and does not have the appropriate water quality and quantity to support a viable San Bernardino springsnail population year-round, the spring will become dry each year for several months beginning during May, leading to the extinction of this endemic animal at its type locality.

g) Off Refuge Erosion Control Measures

The Service or its cooperators will not carry out construction of off-refuge erosion control projects within the San Bernardino Valley landscape located between Guadalupe Canyon and its tributaries to the east and Silver Creek and its tributaries to the west or said construction would be delayed. Some of the DHS tactical infrastructure in the San Bernardino Valley was engineered and constructed with inadequate drainage, which affects the natural flow of precipitation runoff within the San Bernardino Valley watershed, currently inhibiting and redirecting natural drainage and carries loose sediment from the road erosion into downstream wetlands that support federally listed fish, frog, and plant species.

2.2 Alternative B—Proposed Action Alternative

Under the Proposed Action Alternative, the need for action identified in this EA will be satisfied. Many of the perceived negative impacts associated with various DHS tactical infrastructure construction deficiencies in the San Bernardino Valley, which have potentially negatively influenced the endangered species protection and recovery purposes of SBNWR, will be mitigated through a variety of projects described below. See appendix for maps showing general project locations.

These projects will help correct construction deficiencies that resulted from perceived noncompliance with best management practices identified by DHS. Impacts to seasonal and perennial stream crossings, historical wetlands, and opening up accessible routes through previously roadless areas throughout the San Bernardino Valley have created the need for mitigation. Impacts have created opportunities for exotic aquatic species invasion, exotic plant invasion, removed connections among populations of Federally-listed threatened and endangered species, degraded metapopulation structure, encouraged severe erosion to wetlands and uplands, and created opportunities for public access into areas that conflict with endangered species recovery and protection.

a) Fish Barrier

Under this alternative, the Service or a contractor for the Service will construct a concrete fish barrier on SBNWR. The concrete fish barrier will be designed and constructed in Black Draw near the international border to prevent the upstream movement of non-native fish species.

The basic design of this drop barrier will consist of a vertical concrete wall that rises 4-5 feet above a concrete apron on the channel bottom. The apron is designed to produce uniform water velocities that exceed fish swimming abilities, thereby precluding upstream passage. The vertical height of the barrier exceeds the leaping abilities of fish when combined with the shallow, fast-moving water over the apron. At high discharges, effectiveness of the vertical barrier will be lost in the center of the channel as water depths increase, but the vertical drop will be maintained at the edges of the floodwaters where current velocities are lowest. Upstream movements of fish during flood events are not expected in mid-channel because of high current velocities and sediment loads, but potential movements along the edges of floodwaters will be prevented by the maintained vertical drop. The use of heavy equipment will be necessary to facilitate the construction of the fish barrier.

b) Wetland Restoration

By choosing the Proposed Action Alternative, the Service will be able to restore a total of approximately 50-acres of wetlands on SBNWR within the historic San Bernardino Ciénega to help mitigate for wetlands lost or altered due to the construction of DHS tactical infrastructure.

To help remedy damage to the ciénega, a series of shallow wetland units will be constructed north of the international border west of Black Draw. An existing well, tapping into the deep groundwater aquifer, will be used to fill the wetlands, which will drain through water control structures into a buried pipeline that will drain any excess water into Black Draw. Individual wetland units will be designed to allow separately valved inlet pipes for filling, and separate water control structures to allow for incremental water holding capacity and draining. It is anticipated that the wetland units will be separated by dikes that are wide enough to allow motor vehicle passage between units, which will also allow for fire management activity within individually selected units. Heavy equipment will be utilized in construction to dig the impoundments and to trench for the inflow and outflow plumbing.

c) Erosion Control Measures

Under the Proposed Action Alternative, multiple erosion control structures, composed of rock-filled wire basket gabions, earthen berms, single rock dams, and appropriate dikes, each having site specific designs to optimize their effectiveness, will be constructed by the Service within the Black Draw and Hay Hollow Wash watersheds on and adjacent to SBNWR. The erosion control structures will be constructed using heavy equipment and manual labor to complete the structures.

d) All-weather Roads

Under the Proposed Action Alternative, up to ten miles of existing dirt roadways on and adjacent to SBNWR will be upgraded to enable all-weather vehicle travel. Road course will be laid on all existing dirt roadways, and applied to current all-weather roads to facilitate repairs, by the use of heavy trucks. The road course will be leveled using heavy equipment and following standard road engineering practices to allow for proper drainage.

e) Reclamation of Construction Staging Areas

Under the Proposed Action Alternative, accumulated construction debris that was made into “mulch” by DHS contractors and then spread onto multiple tactical infrastructure staging areas totaling about 50 acres in the San Bernardino Valley will be removed, as appropriate. Construction debris “mulch” needs to be removed from at least some of these staging areas simply to allow natural seed germination.

Debris will be removed by the Service using proven methods, which will ultimately enhance wetland and grassland habitats. Methods may include prescribed fire, mechanical removal that has minimal impact on the landscape, or other combinations of methods that ultimately favor perennial and annual grasses and additional native vegetation types. Exotic species that perpetuate themselves on the recovering staging areas may require appropriate use of herbicides, such as those having the trade names Rodeo or Habitat, that are effective and safe to aquatic organisms. Removal of discarded “mulch,” perhaps followed by native grass seeding during the appropriate season, can help restore naturally functioning processes on the landscape and help address the spread of exotic vegetation.

f) Water Wells

Under the Proposed Action Alternative, two separate water wells on and adjacent to SBNWR will be drilled. An existing inadequate well tapping the deep groundwater aquifer, named “Upland Well,” will be abandoned and replaced with a new well to be located near the west boundary of SBNWR along the dirt roadway leading between the refuge shop and the Slaughter Ranch doublewide mobile home. Such positioning will allow burial of water delivery pipe under the existing road leading from the new well to House Pond, located on Slaughter Ranch (Johnson Historical Museum of the Southwest). This well could also easily be plumbed to provide water to Tule Pond. A water meter installed on the well will allow measurement of water used, and will ensure water right compliance. Previous water wells on SBNWR that tap into the deep aquifer produce artesian flow and do not require a pump. It is anticipated that this new well will also produce artesian flow, but could be economically fitted with a solar pump if necessary to increase flow.

A water well and low flow solar pump will be installed on Slaughter Ranch (Johnson Historical Museum of the Southwest) at the head of Snail Spring. This new shallow well and low flow pump will help provide year-round flow of appropriate water quality into the springrun to support the springsnail and other rare aquatic species like the lowland leopard frog. Drilling of

the wells will be performed by a Service Contractor and plumbing for the wells will be done by contractors or Service staff. The drilling of the wells and trenching for the plumbing will be carried out using appropriate heavy equipment.

g) Off-refuge Erosion Control Measures

Under the Proposed Action Alternative, multiple erosion control projects will be constructed within portions of the San Bernardino Valley. The site-specific locations of these projects have not yet been identified, but they will occur between Guadalupe Canyon and its tributaries to the East and Silver Creek and its tributaries to the West in areas where active erosion is occurring. These site-specific projects will help accelerate fish and wildlife habitat restoration processes within the San Bernardino Valley landscape by enhancing important wetlands, grasslands, and wildlife corridors.

Projects will be designed to achieve maximum desired results at a minimum of risk and cost. The Service and its cooperators will use various means of construction to install these erosion control measures, including the use of heavy equipment.

3.0 AFFECTED ENVIRONMENT

3.1 Physical Environment

The San Bernardino Valley lies within the Chihuahuan Desert interface with the Sonoran Desert at an elevation averaging about 3,500-feet, located between mountain ranges reaching up to 8,000-feet. The SBNWR is at the northern margin of the Rio Yaqui Basin in Arizona, creating headwaters, which eventually flow south into the Sea of Cortez. The vast majority of this watershed is in Mexico, with only about 2% draining from the United States. All projects discussed in this EA will occur within 10 miles of the International Border with Mexico and run approximately eighteen miles from east to west.

3.1.1 Air Quality

Currently air quality in this region is good, and is much improved from previous decades when copper production was a major part of the economies in both Arizona and Sonora. Some pollution from metropolitan areas comes primarily from Agua Prieta, Sonora in the form of dust and some carbon emissions from vehicles. Smoke resulting from heating with wood during winter months, and periodically from wildfires and/or prescribed fires can occur for short periods of time. Dust in the San Bernardino Valley comes largely from vehicular traffic on Geronimo Trail Road, Guadalupe Canyon Road, and from the DHS Border Road, with prevailing winds coming out of the SW.

3.1.2 Soils/Geology

The San Bernardino Valley is located in the Basin and Range physiographic province. Basaltic volcanism was active in the area contemporaneously with basin and range tectonic activities. As a result, the basin fill consists of alluvium interlayered with basalt flows. Limited dating of basalt

flows suggests that volcanism was active on the valley floor from approximately 3.3 million years ago to about 274 thousand years ago.

Within the project area, there are areas where soils have been exposed and active erosion is starting to occur. These areas are targeted for treatment in the proposed action.

3.1.3 Water Resources and Quality

The Río Yaqui Basin is a large riverine system, which drains portions of southeastern Arizona and southwestern New Mexico in the United States, and eastern Sonora and western Chihuahua in Mexico. These rivers flow southwesterly where they eventually join to empty into the Sea of Cortez near Ciudad Obregon, Sonora. The entire basin is approximately 73,000 square kilometers. Less than 2% of the entire basin is in the United States, with drainages receiving runoff from the Swisshelm, Chiricahua, Mule, Pedregosa, Perilla, and Peloncillo Mountains.

Other than mostly ephemeral stream channels, the San Bernardino Ciénega is the most extensive wetland in the region, and forms an important migratory link between mesic environments of the Sierra Madre Occidental with those further to the north. It supports a unique and endemic biota, varying from special vertebrates to invertebrates and plants; rare species listed as endangered or threatened both by Mexico and the United States are present. Its natural history is well known so baselines for restoration are available. The ciénega was well-watered in the past, beginning on what is now the SBNWR in the United States and extending into Sonora for >2.5 km (1.6 mi) along Río San Bernardino (Black Draw). It is now reduced to remnants associated with artesian wells, springs, and artificial ponds. Even in its degraded state it remains an oasis within these otherwise arid lands, providing stopover, breeding, and year-around habitat for a significant number and diversity of organisms.

Currently, some of the DHS tactical infrastructure in the San Bernardino Valley impacts precipitation runoff and natural drainage associated with the extensive San Bernardino Ciénega in both the United States and in Mexico, in some cases inhibiting and/or redirecting water flow in the basin. This altered or disrupted water flow currently impacts the vegetation community composition and abundance supporting a diversity of plant, animal, and invertebrate species, some of which are federally listed as threatened or endangered and ongoing erosion is negatively impacting water quality.

Arizona water rights on San Bernardino NWR date back to the late 1800s at the time of original settlement of the area by the cattle industry. The rights are divided into two types; groundwater permits and unlitigated surface water rights. The refuge has state groundwater well registration permits for 10 wells on San Bernardino NWR and also the Johnson Museum property. These wells exist outside of an Arizona Active Management Area, and have not been adjudicated. The wells have a quantity of 250-acre feet per annum for each claimed registration, which equals 155 gallons per minute. The beneficial use for these wells is specified as “stock water and water production.” These wells have the very senior priority dates of January 1, 1903. However, the rights for the wells do not protect the artesian flow, so if the artesian head pressure drops in the basin, the Service would be required to outfit the wells with pumps. If the head were to drop to a point where the wells went dry, the Service would be required to drill deeper wells. Finally, if

the groundwater was depleted in the basin, the state would have the legal responsibility to shut down junior pumpers in order to restore water for the Service's wells.

The Service has state surface water claims for six springs on the refuge as well as the Johnson Historical Museum property. These claims have yet to be adjudicated, and do not have the legal standing of a permit. The priority date for these waters is January 1, 1884. The beneficial use for these claims is specified, depending on the spring, as a combination of stock, domestic, irrigation, and recreational. The quantity of the water claimed ranges from 3.8 - 62 gallons per minute.

3.2 Biological Environment

3.2.1 Vegetative Community

Over 493 varieties of plants have been recorded from the area. The vast majority of these are native species, leaving the ecosystem relatively free from exotic invader species. Some Russian thistle *Salsola iberica*, Johnsongrass *Sorghum halapense*, and Lehmann's lovegrass *Eragrostis lehmanniana* exists and deserves control. At least 77 varieties of grasses have been recorded at the project area, indicative of the regional diversity and species richness. Wetland species include Huachuca water umbel, five species of sedge, spikerush, bulrush, three species of rush, four species of duckweed, sago pondweed, cattail, and others. These species and probably others were at one time abundant and widespread in the area, but are currently limited in distribution and abundance due to human caused changes to the habitat, namely ranching and other agricultural uses. Dominant shrub species in the upland portions of the project area are mesquite, various forms of acacia, creosote, and tarbush.

The following is a breakdown of what habitat types the individual projects will occur in:

- Fish barrier – cottonwood-willow riparian
- Wetland restoration – proposed area is in a fallow field (abandoned cultivated field)
- Erosion control (Refuge and valley) – various habitats to include; cottonwood-willow riparian, riparian scrub, and desert scrub
- All-weather roads – roads traverse many habitat types from uplands to cottonwood-willow riparian
- The staging areas are located in upland habitat of Chihuahuan desert scrub
- Water wells – both wells will be drilled in Chihuahuan desert scrub and trenches for plumbing for outflows will be done on existing roads

3.2.2 Wildlife

The upper Río Yaqui watershed including SBNWR has long been famous for its biodiversity, beginning with E. A. Mearns who sampled there in 1892 and clearly anticipated far greater scientific discoveries in expressing regret he could not explore further. This early recognition carries to the present. At least 315 bird species have been documented on the refuge, including many nesting species. In addition, at least 58 mammal, 30 reptile, 10 amphibian, 8 native fish, and hundreds of invertebrate species have been recorded. Due to reduced populations, habitat loss, or a combination of causes, a number of species and species groups receive special

protection or management designation. Twenty-two birds that use the refuge are on Mexico's list of species of concern, 36 are on a "Priority Species Pool" developed by Partners in Flight for adoption by the Service as part of their "List of Species of Management Concern;" 6 are listed by the state of Arizona. Excluding bats, at least 11 mammals that frequent the area receive listing by the Mexican government, 6 as endangered. The noteworthy amphibians and reptiles are all restricted geographically and suffering population declines due to habitat loss or negative interactions with exotic species, and also are listed by Mexico. Eight of the nine fishes in the area are listed as threatened, endangered, or of special concern either by the Mexican government or by the Service. Six fish species also are "of concern" to the State of Arizona, and federally designated critical habitat exists for a shiner, chub, and catfish in the United States. Viable populations of all nine fishes persist in or adjacent to the area in Mexico. The San Bernardino springsnail is of special concern in the United States and faces potential listing by the Service. While the diversity of fish has been well documented, baseline inventories of aquatic invertebrates are almost unknown. The potential for discovery of numerous new endemic species is great due to the unique geology, isolation, and diversity of habitats.

3.2.3 Threatened and Endangered Species and Other Special Status Species

Various human activities have altered the landscape and ground water levels and have drastically changed the ecosystem since the turn of the century. SBNWR provides a critical role in maintaining a sanctuary for multiple plant and wildlife species of special concern (federal and/or state listed) which are identified in the following table.

Table 3.2.3 Known Federal and State Listed Species that Occur on and Immediately Adjacent to San Bernardino NWR. Status: WC1 = Arizona Wildlife Species of Special Concern, FE = Federally Listed Endangered, FT = Federally Listed Threatened.

Status	Common Name	Scientific Name	Occurrence
FE	Huachuca Water Umbel	<i>Lilaeopsis schaffneriana</i>	resident
WC1	San Bernardino Springsnail	<i>Pyrgulopsis bernardina</i>	resident
FE/WC1	Yaqui Chub	<i>Gila purpurea</i>	resident
FT/WC1	Yaqui Beautiful Shiner	<i>Cyprinella formosa</i>	resident
FT/WC1	Yaqui Catfish	<i>Ictalurus pricei</i>	resident
FE/WC1	Yaqui Topminnow	<i>Poeciliopsis o. sonoriensis</i>	resident
FT	Chiricahua Leopard Frog	<i>Rana chiricahuensis</i>	resident
WC1	Mexican Gartersnake	<i>Thamnophis eques</i>	resident
WC1	Yellow-Billed Cuckoo	<i>Coccyzus americanus</i>	nesting
FE	Lesser Long-nosed Bat	<i>Leptonycteris curasoae</i>	migrant

Several of the species on the above list occupy habitat within a proposed project site or habitat near a site. There are several reaches within Black Draw and Hay Hollow Wash that have permanent water and provide habitat for the listed fish species. The fish barrier and the erosion control projects are planned to be constructed away from these areas and to be done prior to the rainy season to avoid flowing water situations likely to occur. The yellow-billed cuckoo nests in the cottonwood-willow riparian habitat on the refuge where the fish barrier and some of the erosion control measures will be constructed. It is planned for construction to take place outside of nesting season for the cuckoo. None of the other species on the list are likely to be impacted from any of the proposed projects, but if there are impacts, it is believed they will be short-term and negligible.

3.3 Human Environment

3.3.1 Cultural Resources

The San Bernardino Valley, including SBNWR, lies within a rich cultural heritage area, with documented human inhabitation going back for at least 10,000 years. The area encompassing what is now the refuge has been actively occupied during both the prehistoric and historic periods, and prehistoric sites appear to reflect both Mogollon (San Simon Branch) and a later Salado occupation of the area. Numerous archeological sites exist on this refuge, and a large Salado habitation site at the north end of the refuge, named the “Slaughter Ranch Site,” was partially excavated and recorded by Mills and Mills in 1966. A number of additional sites were recorded and reported by V. K. Pheriba Stacy in 1974. The refuge includes a portion of the San Bernardino Ranch National Historic Landmark (designated in 1963), though most of this landmark lies on the adjacent 131-acre Slaughter Ranch property. During 1982, an archaeological inventory was completed on this area and 24 archaeological sites were identified. These included the fortified military encampment used for troop training and border security, a number of historic house sites and associated trash dumps, and three prehistoric Mogollon sites. In addition, 33 sites and 99 isolated cultural features and artifacts existing on 2,000 acres of San Bernardino NWR west of Hay Hollow Wash have been documented by University of Arizona archeologists as part of a cultural resource inventory conducted under FWS contract from August 1984 - March 1985. These include archaic sites dating from 1500- 500 BC and also late prehistoric Animas phase (Mogollon and Salado) sites, including extensive settlements and pueblos, dating from about 1200 – 1400 AD. Although most sites are relatively secure from vandalism and “pot hunting”, some of the sites are in the immediate proximity of high public use areas. Additionally, ground-disturbing activities on the refuge have the potential to impact cultural resources. The refuge has been mapped for all archeological and cultural resources and all projects will be done so as to not impact them. Sites off of the refuge may require surveys prior to any construction taking place.

During July 1901, the “Boundaries of the San Bernardino Private Land Grant” were surveyed by John A. Rockfellow, a Deputy Surveyor for the U.S. Surveyors General Office. He reported an abandoned, two-room house with intact roof and walls and an open central passage that straddled the international border. Local stories report that this site was occupied from 1880 to 1910 by a Mormon employee of John Slaughter who, in order to “legally” keep two wives, housed one in the United States and one in Mexico. The “Mormon House” was constructed of adobe bricks

placed on basalt fieldstones without mortar, and the eroded walls have covered and protected most of the foundation for many years. During 2008, when DHS contract archeologists were surveying this portion of the international border prior to construction of a border road and vehicle barrier, refuge staff showed them the location of the “Mormon House” and urged DHS to protect the historic site. Ultimately, the portion of the site in the United States was excavated under contract by e²M of Denver, Colorado and then covered with plastic sheeting, buried with soil and base coarse material, and fenced in an effort to protect the site from vehicle traffic and road maintenance equipment. The fieldstone foundation remains visible on the south side of the border.

3.3.2 Socioeconomic Resources

The San Bernardino Valley, with SBNWR at its center, is located about 16 miles east of the city of Douglas, Arizona with a population of about 16,000. Several additional towns are within thirty to ninety miles away from the refuge, with the city of Tucson located about 100 miles to the northwest. The predominate land uses in the vicinity of the refuge are livestock grazing, with some irrigated farming. The Douglas Chamber of Commerce lists the refuge as one of the area’s main tourism attractions, and about 6,000 people visit SBNWR and the adjacent Johnson Historical Museum of the Southwest each year. An abundance of public land and associated State Trust Land in Cochise County make southeast Arizona popular with hikers, birders, hunters, photographers, and other outdoor enthusiasts. The refuge also plays a secure role in the local economy because refuge employees live in adjacent communities, own property, and support local businesses through routine purchases.

3.3.3 Visitor Services/Activities

Geronimo Trail Road and Guadalupe Canyon Road, both maintained by Cochise County, are the main routes for vehicular access through the San Bernardino Valley, which contains no formal visitor services other than those provided on SBNWR and Slaughter Ranch. Basic services include public restrooms, parking areas, regulatory signs, and educational signs.

The majority of the project sites, including six miles of road, which would be upgraded, are open to the public.

3.3.4 Visual Resources

The San Bernardino Valley is a sparsely populated, scenic area along the border between Arizona and Sonora. Few roads cross the region. Previously roadless areas of the landscape along the international border now contain DHS tactical infrastructure, but the landscape looks generally like it did about 100 years ago predominated by native vegetation.

3.3.5 Wilderness

There is no designated Wilderness in the San Bernardino Valley.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter analyzes and discusses the potential environmental effects or consequences that can reasonably be expected with the implementation of the No Action and Proposed Action Alternatives described in Chapter 2.0 of this EA. An analysis of the effects of management actions has been conducted on the physical environment (air quality, water quality, and soils); biological environment (vegetation, wildlife, and threatened and endangered species); the human environment (cultural resources and recreational use); and the natural environment (visual resources). The direct, indirect, and cumulative impacts of each alternative are considered. Direct effects are the impacts that would be caused by the alternative at the same time and place as the action. Indirect effects are impacts that occur later in time or distance from the Proposed Action Alternative. Cumulative effects are incremental impacts resulting from other past, present, and reasonably foreseeable future actions, including those taken by federal and non-federal agencies, as well as undertaken by private individuals. Cumulative impacts may result from singularly minor but collectively substantial actions taking place over a period of time.

The time frame for the analysis in this EA is up to 10 years from the signing of the final decision and implementation of the Proposed Action. The construction period for the fish barrier, wetland restoration, erosion control measures, all-weather roads; the reclamation of the staging areas; and the drilling of the two water wells is dependent upon funding approval and construction setbacks and delays.

4.1 Physical Environment

4.1.1 Impacts on Air Quality

Alternative A – No Action Alternative

Under the No Action Alternative, there will be no change in air quality in the short-term from current conditions since the proposed projects described in section 2.2 (fish barrier, wetland restoration, erosion control measures on/adjacent to refuge, construction site reclamation, water wells, and off-refuge erosion control measures) will not be implemented. Continued use of existing (unimproved) roads is likely to have long-term negative impacts on air quality; there will be an increase in fine particles becoming airborne from medium to strong winds during dry periods.

Alternative B – Proposed Action Alternative

Under the Proposed Action Alternative, for the six proposed projects described in section 2.2, there will be minimal direct, short-term negative effects to the air quality. These impacts would be negligible and will be attributed to exhaust from heavy equipment and dust being generated from the use of heavy equipment. There will be no long-term effects to air quality from any of the proposed projects.

4.1.2 Impacts on Water Quality and Quantity

Alternative A – No Action Alternative

- a) Fish Barrier – With this alternative the fish barrier will not be constructed; therefore, water quality and quantity will remain at current levels.
- b) Wetland Restoration – Without the restoration of additional wetland habitat there would be less seasonal and perennial water available and the waters currently on SBNWR would decrease in quality. In addition, there would be a continuation of altered drainage between the historic ciénega lands found on the refuge and adjacent properties.
- c) Erosion Control Measures – Under the No Action Alternative, the SBNWR would not be able to control the altered natural drainage and would lose some ability to catch and retain water during precipitation events to assist ground water recharge. There would also be no way for SBNWR to capture waterborne sediments during floods, which would lead to continued erosion of stream channels and aggradation of wetlands. Without additional erosion control measures some of the areas of discarded debris could lead to contamination farther downstream.
- d) All-weather Roads – Non all-weather roads will continue to erode during periods of wet weather. This soil will continue the aggradation of stream channels and wetland impoundments, decreasing water quality.
- e) Reclamation of Construction Staging Areas – Under this alternative, soils from the staging areas will continue the aggradation of stream channels and wetland impoundments, decreasing water quality.
- f) Water Wells – No new wells will be put in place. An adequate water supply having appropriate water quality capable of supporting the populations of federally listed endangered and threatened species located at House Pond, Tule Pond, Snail Spring, and additional associated wetlands will not be assured during dry months of the year.
- g) Off-refuge Erosion Control Measures – Under the No Action Alternative, portions of the San Bernardino Valley landscape would not be able to withstand the altered natural drainage and would lose some ability to catch and retain water during precipitation events to assist ground water recharge. There would also be no way for portions of the landscape to capture waterborne sediments during floods, which would lead to continued erosion of stream channels and aggradation of downstream wetlands.

Alternative B – Proposed Action Alternative

The direct impacts of implementing all projects (construction, digging, trenching, grading, etc.) would temporarily expose soil and increase the potential for increasing sedimentation and turbidity; however, these impacts are expected to be short-term and negligible at a local scale. Best management practices will be used to further minimize impacts. The long-term impacts would be beneficial as discussed below:

- a) Fish Barrier – While not its main purpose, the construction of a fish barrier on SBNWR will aid in slowing water in Black Draw during flood events, allowing for it to be held longer on the land and recharging ground water.
- b) Wetland Restoration – Under the Proposed Action Alternative, the restoration of additional wetlands would increase the quality and availability of seasonal and perennial water on SBNWR.
- c) Erosion Control Measures – The installation of multiple erosion control measures on and near the Refuge would stabilize stream channels and reduce sediment loads in waters during flood periods. In addition, drainage patterns altered from DHS construction would be corrected; water in stream channels would be slowed during flood events, allowing for ground water recharge; and potential contaminants would be not be mobilized downstream.

The construction and placement of additional erosion control structures in key locations in the watershed will help control water that has been unnaturally redirected due to the recent tactical infrastructure construction. Such structures will catch water-borne sediments being transported during precipitation events, improve the landscape's ability to halt and slow the scouring erosive impacts of seasonal flood flows, and more effectively catch and hold precipitation runoff to provide water for fish and wildlife. Erosion control structures will help re-build natural floodplains by controlling and directing aggradation, providing opportunities for precipitation to remain on the landscape rather than running off as floodwater, enhancing soil permeability and water infiltration, helping restore groundwater recharge in the shallow aquifer,

- d) All-weather Roads – By converting all roads on and adjacent to the refuge to all-weather roads, there would be a decrease in erosion of these roadways, thereby reducing sediment reaching streams and wetland impoundments during periods of wet weather.
- e) Reclamation of Construction Staging Areas – Under the Proposed Action Alternative the restoration of the staging areas used by DHS contractors would decrease sediment reaching streams and wetland impoundments during periods of wet weather.
- f) Water Wells – The drilling of a new water well to supply House Pond on the Slaughter Ranch will ensure proper water quality and ensure adequate water quantities in the pond during periods of arid weather and heavy water use. The second new well at Snail Spring will ensure adequate moist soil throughout the driest portions of the year, benefitting recovery of springsnails.
- g) Off-refuge Erosion Control Measures – The installation of site-specific erosion control projects within the San Bernardino Valley would stabilize stream channels and reduce sediment loads into downstream wetlands during flood periods. In addition, drainage patterns altered from DHS construction would be corrected, and water in stream channels would be slowed during flood events allowing for ground water recharge.

4.1.3 Impacts on Soils

Alternative A – No Action Alternative

- a) Fish Barrier – By not constructing a fish barrier there will be no change in soil quality from current conditions.
- b) Wetland Restoration – Without restoration of additional wetlands on SBNWR there will be a continued loss of topsoil due to unstabilized vegetation.
- c) Erosion Control Measures – Under this alternative there will be a continued loss of streambed material during periods of flooding and continued destabilization of soil along riparian margins. In addition, without additional erosion control measures some of the areas of discarded debris could lead to contamination farther downstream.
- d) All-weather Roads – Under the No Action Alternative there will be an ongoing loss of hydric soils on roads not converted to all-weather substrate material.
- e) Reclamation of Construction Staging Areas – With no restoration of the staging areas, non-native vegetation will continue to establish and in doing so could alter soil chemistry, preventing the growth and propagation of native plant species.
- f) Water Wells – Under this alternative there would be no change in soil quality from current conditions.
- g) Off-refuge Erosion Control Measures – Under this alternative there will be a continued loss of streambed material throughout the San Bernardino Valley landscape during periods of flooding and continued destabilization of soil along riparian margins.

Alternative B – Proposed Action Alternative

Under the Proposed Action Alternative, all six proposed projects (a-f) would have impacts on soils... These impacts are short-term and will range from negligible to moderate. However, the long-term benefits to the soil from each project will more than out way the impacts. They are described below.

- a) Fish Barrier - The addition of a fish barrier in Black Draw will assist with the retention of some sediment in the draw, leading to increased soil permeability for water infiltration; restore soil stability at the rooting zones of plants in riparian areas; and increase soil stabilization promoting native plant production.
- b) Wetland Restoration – With the restoration of wetland areas, there will be increased stabilization of vegetation allowing for the retention of top soil during heavy precipitation events and strong winds.
- c) Erosion Control Measures – Installing additional erosion control measures will improve soil permeability for water infiltration; restore soil stability at the rooting zones of plants in riparian areas; and increase soil stabilization promoting native plant production.

- d) All-weather Roads – The implementation of the Proposed Action Alternative will lead to the retention of hydric soils during precipitation events and during medium to strong winds.
- e) Reclamation of Construction Staging Areas – By removing non-native plant species and excess debris from the staging areas and replanting with native species, soil chemistry will improve and support viable plant populations and thereby increase soil retention.
- f) Water Wells – Providing water to Snail Spring during the driest parts of the year will help maintain proper soil chemistry and promote native plant growth, benefitting endemic springsnail recovery.
- g) Off-refuge Erosion Control Measures – Installing site-specific erosion control projects across the San Bernardino Valley landscape will improve soil permeability for water infiltration; prevent the acceleration of stream channel erosion in the San Bernardino Valley restoring soil stability at the rooting zones of plants in riparian areas; and increase soil stabilization promoting native plant production.

4.2 Biological Environment

4.2.1 Impacts on Habitat

Alternative A – No Action Alternative

- a) Fish Barrier – By not building the fish barrier there will be no change in the cottonwood-willow riparian habitat from what currently is found in the area for the proposed project.
- b) Wetland Restoration – Under this alternative the lack of restoring additional wetlands will allow for the continued loss of grassland habitat; loss of plant diversity; increase in annual invasive plant species; and provide less available aquatic habitat.
- c) Erosion Control Measures – The lack of additional erosion control measures in streams and washes would allow for the continuation of decreasing native plant populations in grassland and riparian habitats; increase in non-native plant species in disturbed areas; loss of wetland habitat to aggradation; and loss of riparian habitat to siltation and possible hazardous spills.
- d) All-weather Roads – Under the No Action Alternative the degradation of riparian and aquatic habitats would continue from sediment runoff. This could lead to aggradation of wetlands and a decrease in water quality in both lentic and lotic habitats.
- e) Reclamation of Construction Staging Areas – Altered upland areas, currently covered by up to three-feet thick of woody mulch, and subsequently hydroseeded with a mix that included non-native species such as red flax (*Linum grandiflorum* var. *rubrum*), will be expected to become increasingly established with exotic plant species such as Russian thistle, Malta star thistle, Lehmann's lovegrass, bufflegass, and other species that favor disturbed sites.
- f) Water Wells – This alternative will allow the Spring Snail habitat to continue to dry out during the warmest parts of the year. Water in House Pond will continue to fluctuate with irrigation use and water quality will diminish.

- g) Off-refuge Erosion Control Measures – The lack of site-specific erosion control projects in streams and washes across the San Bernardino Valley landscape would allow for the continuation of decreasing native plant populations in grassland and riparian habitats; increase in non-native plant species in disturbed areas; loss of downstream wetland habitat to aggradation; and loss of riparian habitat to siltation.

Alternative B – Proposed Action Alternative

Each of the proposed projects will have some impact on habitat in the short-term, but the long-term benefits associated with each project will be more than enough to offset the negatives. Both the short-term and long-term impacts are described below.

- a) Fish Barrier – Under this alternative, there will be some degradation of cottonwood-willow riparian habitat at the site of construction, which should be no more than one acre in size within 100 meters of the International Border with Mexico. In addition, there will be some loss of area for vegetation regrowth. However, secondary to its primary purpose the fish barrier will catch sediment and help restore some streambed erosion providing other areas for riparian vegetation to establish.
- b) Wetland Restoration – During the construction phase of this project, there will be loss of terrestrial habitat, but once completed the addition of restored wetlands will help stabilize soil and vegetation communities near the site, increasing habitat quality. The addition of restored wetlands will also provide for adequate habitat for aquatic species dependent upon this habitat type and areas that are adjacent to the restored wetlands will return to native grasses from the fallow field status that is currently in place at the proposed project site.
- c) Erosion Control Measures – There will be some disturbance to the various habitats, cottonwood-willow riparian, riparian scrub, and desert scrub, when placing the erosion control measures, but they will be minimal and short-term. Total affected area is unknown at this time, but the habitat disturbance for the various control measures can range in size from 2 square meters up to 150 square meters for each.

By placing additional erosion control measures in streams and washes on and adjacent to the refuge, there will be increased native plant colonization and growth through soil stabilization (grassland and riparian); protection of aquatic habitat (wetlands) from aggradation; and a decrease in the downcutting of streambeds improving the health of riparian habitat.

- d) All-weather Roads – Under the Proposed Action Alternative for this project the amount of sedimentation reaching stream systems and wetlands will be greatly reduced allowing for improved water quality in aquatic habitats. Since this project is taking place on already disturbed sites there will be negligible disturbance during implementation of this project. Total of roads to be repaired or converted to all-weather roads is ten linear miles.
- e) Reclamation of Construction Staging Areas – By removal of discarded “mulch,” perhaps followed by native grass seeding during the appropriate season, there will be enhanced long-term viability and integrity of wetland and upland habitats by controlling density and spread of non-native plant species. This project will help restore naturally functioning processes on

the landscape and help address the spread of exotic vegetation. Negative impacts to habitat are negligible in the short-term. Areas affected total 3.8 acres.

- f) Water Wells – There will be minimal disturbance to habitat for this project at its initiation. The long-term benefits of taking the Proposed Action Alternative will be the sustained moist soil habitat throughout the year; sustained water levels in House Pond and balanced water chemistry.
- g) Off-refuge Erosion Control Measures – By placing site-specific erosion control measures in steams and washes throughout the San Bernardino Valley landscape, there will be increased native plant colonization and growth through soil stabilization (grassland and riparian); protection of downstream wetlands from aggradation; and a decrease in the downcutting of streambeds improving the health of riparian habitat. There will be some disturbance to habitat when placing site-specific controls, but they will be minimal and short-term.

4.2.2 Impacts on Wildlife

Alternative A – No Action Alternative

- a) Fish Barrier – Under this alternative, there could be a loss of native species due to direct and indirect competition from non-native species.

Under the No Action Alternative for the six other proposed projects (b, c, d, e, f, g) there would be no direct impacts since the projects would not be implemented. In the long-term, there could be a decline in wildlife populations (aquatic and/or terrestrial) due to the continuing decline of habitat.

Alternative B – Proposed Action Alternative

- a) Fish Barrier – Under this alternative there will be minimal wildlife, avian, reptilian, and mammalian, disturbance during construction, this will be short-term. Long-term effects include the segregation of native fish populations, requiring active management to maintain genetic variability of those populations. However, taking this action will prevent non-natives from competing directly and indirectly with native species.
- b) Wetland Restoration – Under the Proposed Action Alternative, the restoration of wetlands will increase the quality of habitat near areas of restoration providing necessary cover and forage for wildlife species. The restoration of additional wetlands will also be beneficial in protecting migration corridors used by birds and mammals by increasing the availability and quality of seasonal and permanent water, and by increasing the overall quality of native grasslands. There will be minimal disturbance to wildlife during the initial restoration of wetlands.
- c) Erosion Control Measures – The placing of additional erosion control measures into streams and washes will improve riparian and grassland habitats, stabilizing or increasing wildlife populations. There will be minimal disturbance to wildlife during the placement of structure in the streams and washes.

- d) All-weather Roads – By converting all roads on or near the refuge to all-weather substrate will reduce sedimentation of wetlands and streams improving habitat for the sustainability of fish and wildlife populations. The disturbance to wildlife will be no more than is currently experienced.
- e) Reclamation of Construction Staging Areas – The restoration of the staging areas will increase quality forage for wildlife, which could lead to population increases. There may be some take of invertebrate and other ground dwelling organisms as the debris and soil are removed.
- f) Water Wells – Under this action, moist soil dependent species will be assured of adequate habitat throughout the year. Water levels and quality in House pond will be stabilized promoting healthy and viable populations of fish and wildlife. There will be some minimal disturbance to wildlife as the wells are being drilled and the plumbing is installed.
- g) Off-refuge Erosion Control Measures – Placing site-specific erosion control measures throughout the San Bernardino Valley landscape will improve riparian and grassland habitats, stabilizing or increasing wildlife populations. There will be minimal disturbance to wildlife during the placement of site-specific projects in the streams and washes.

4.2.3 Impacts on Threatened and Endangered Species

Alternative A – No Action Alternative

- a) Fish Barrier – Without construction of a fish barrier, there could be a loss of listed species due to direct and indirect competition from non-native species.

Under the No Action Alternative for the six other proposed projects (b, c, d, e, f, g) Off-refuge Erosion Control Measures - there could be a decline in listed species populations due to the continuing decline of habitat.

Alternative B – Proposed Action Alternative

- a) Fish Barrier – It is planned to construct the fish barrier outside of the rainy season, when Black Draw is not flowing, to prevent impacts to listed fish species that use the draw. Timing will also be determined to avoid the breeding and nesting of yellow-billed cuckoos that utilize riparian habitat. Construction of the fish barrier would result in segregation of federally-listed fish populations in the U.S. from those in Mexico, active management will be required to maintain genetic variability of those populations. However, taking this action will prevent non-natives from competing directly and indirectly with the listed fish species.
- b) Wetland Restoration – There will be no negative impacts to any of the listed species on the refuge during completion of this project. The restoration of wetlands will increase the quality of habitat and create additional habitat for the federally listed fish species as well as other listed species that utilize this habitat.
- c) Erosion Control Measures – Construction of the erosion control measures will take place when the washes and arroyos are dry, so there will be no impacts to listed fish species.

Timing will also be determined to avoid the breeding and nesting of yellow-billed cuckoos that utilize riparian habitat. The placing of additional erosion control measures into streams and washes will decrease sediment loads in streams and wetlands; improving birth/hatching rates, improving respiration capabilities, and improving the prey base for federally listed fish.

- d) All-weather Roads – There will be no negative impacts to listed species in completing this project. By converting all roads on or near the refuge to all-weather substrate will reduce sedimentation of wetlands and streams improving birth/hatching rates, improving respiration capabilities, and improving the prey base for federally listed fish.
- e) Reclamation of Construction Staging Areas – There will be no negative impacts to any of the listed species on the refuge during completion of this project. The restoration of the staging areas will decrease sediment loads in streams and wetlands; improving birth/hatching rates, improving respiration capabilities, and improving the prey base for federally listed fish.
- f) Water Wells – There will be no disturbance to listed species as the wells are being drilled and the plumbing is installed. Under this action, moist soil will be maintained throughout the year providing the necessary habitat for the San Bernardino Springsnail, as well as other listed species that utilize this habitat type. Water levels and chemistry in House Pond will be stabilized providing the necessary requirements to sustain the federally listed fish found there.
- g) Off-refuge Erosion Control Measures – There will be no negative impacts to listed species during implementation of this project. The placing of site-specific erosion control measures across the San Bernardino Valley landscape will decrease sediment loads in downstream wetlands; improving birth/hatching rates, improving respiration capabilities, and improving the prey base for federally listed fish.

4.3 Human Environment

4.3.1 Impacts on Cultural Resources

Alternative A – No Action Alternative

Under this alternative, there are no anticipated direct or indirect impacts to the cultural environment, as current conditions will be maintained, and no ground disturbance will occur.

Alternative B – Proposed Action Alternative

The entire SBNWR west of Hay Hollow Wash has been surveyed to provide an accurate and detailed map of all known archeological sites on the refuge, and these areas will be avoided. Under this alternative no impacts to archeological or cultural sites will occur. Projects located on the Refuge will be designed to avoid known sites with archeological significance during mechanical treatments and ground disturbing activities. Site-specific, off-refuge projects within the San Bernardino Valley landscape will potentially need to be surveyed prior to initiating any erosion control projects.

4.3.2 Impacts on Socioeconomics

Alternative A – No Action Alternative

The economic and social condition of the San Bernardino Valley would remain the same. The refuge will continue to be one of the area's attractions for ecological tourism. The presence and operation of the refuge provides economic benefits to the surrounding community within an hour's drive of the refuge. The refuge attracts local, national, and international visitors and by attracting visitors to the area, the refuge generates revenue for the local economy. Much of the refuge's annual budget is recycled into local businesses through refuge staff, purchases of equipment and supplies, as well as contracts for local labor to accomplish refuge projects. The refuge provides full-time employment to seven individuals that live in nearby communities.

Alternative B – Proposed Action Alternative

Under this alternative, the economic and social condition of the San Bernardino Valley will improve. The area, including SBNWR, will use local businesses for materials and local contractors for labor to complete the projects proposed for this action. The habitat improvements that will occur on the refuge and adjacent properties will make the refuge more attractive to wildlife and this will have the possibility to increase visitors to the refuge and surrounding communities increasing their revenue.

4.3.3 Impacts on Aesthetic and Visual Resources

Alternative A – No Action Alternative

There would be no immediate change to the existing San Bernardino Valley landscape, but over time continued erosion of uplands, streams, and washes, could result in loss of native vegetation and significant amounts of soil, which would adversely impact aesthetic and visual resources in the area in the long-term.

Alternative B – Proposed Action Alternative

All projects under the Proposed Action Alternative will have short-term negative effects to aesthetic resources on the San Bernardino Valley landscape, including SBNWR. The minor visual effects could occur from construction equipment, dust, and the loss of vegetative cover. In the long-term, visitors may experience improved visual quality of the refuge and surrounding landscape consistent with natural ecological function.

4.4 Assessment of Cumulative Impacts

A cumulative impact is defined as an impact on the environment that results from the incremental impact of a [proposed] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Cumulative impacts are the overall, net effects on a resource that arise from multiple actions. Impacts can “accumulate” spatially, when different actions affect different areas of the same resource. They can also accumulate over the course of time, from actions in the past, the present, and the future. Occasionally, different actions counterbalance one another, partially cancelling out each other’s effects on a resource. But more typically, multiple effects add up, with each additional action contributing an incremental impact on the resource.

Some of the negative preceding and ongoing actions within the San Bernardino Valley that have and still do contribute to the cumulative impacts are: road dragging by Border Patrol, used as a tool to detect illegal immigration; road repair, conducted by the county roads department; gravel and rock mining, by corporations and private landowners; cattle ranching, by private landowners; and water development, by private landowners. Positive actions taking place in the San Bernardino Valley are erosion control and grassland restoration by private landowners, as well as various government agencies.

Alternative A – No Action

As shown in the preceding analysis, it can be anticipated that maintaining the current management and foregoing correction of impacts attributed to DHS tactical infrastructure by choosing the No Action Alternative, would hamper the Refuge in its mission to restore habitat and work towards recovery of native fish found in the San Bernardino Valley. The No Action alternative would be expected to contribute to further degradation of the Refuge’s habitat and water resources and likely increase the rate of erosion with in many, if not all, of the washes and draws that are considered the headwaters of the Río Yaqui. Furthermore, this alternative will aid in the encroachment of non-native species onto the refuge and surrounding areas, decreasing the value of habitat for native wildlife in the region. In addition, other conservation activities in the San Bernardino Valley, including those in Mexico, are considered unlikely to offset the expected negative trends associated with the impacts to the environment from DHS tactical infrastructure construction within the valley.

Alternative B – Proposed Action

Conversely, by implementing the Proposed Action Alternative, it is expected that many of the negative impacts caused by the DHS construction would be effectively addressed. The proposed action will allow the refuge and its partners to continue restoration efforts within the valley to the benefit of native wildlife. Choosing the proposed action will allow the Refuge and its partners the ability to stop or slow the damages that are occurring and that are likely to magnify in effect over time.

While past activities may have cumulatively impacted resources in the area, the Proposed Action should allow refuge management to slow damage from many of the actions impacting the area and reverse others. Such as, management issues from prior environmental damage attributed to agricultural use (ranching, farming, etc.) will be slowed and their negative effects will not be added to by the impacts from the DHS tactical infrastructure construction.

4.5 Environmental Justice

None of the alternatives for the proposed projects described in this EA will disproportionately place any adverse environmental, economic, social or health impacts on minority or low income populations. Implementation of the proposed actions is anticipated to benefit the environment and the people in the surrounding communities.

4.6 Indian Trust Effects

No Indian Trust Assets have been identified in the portion of the San Bernardino Valley adjacent to the International Border with Mexico. There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result from implementation of either alternative for the projects proposed in this EA.

4.7 Unavoidable Adverse Effects

As proposed under Alternative B, there will be some loss of wildlife habitat at project sites that will require several years to recover. In addition, there will be some short-term disturbance to resident wildlife, but these impacts are expected to be minimal. Opportunities for public viewing, hiking, and photography of wildlife on the refuge would not be impacted.

4.8 Irreversible and Irretrievable Commitment of Resources

Neither of the alternatives for the proposed projects in this EA would result in a large commitment of nonrenewable resources. Implementation of the projects would require the irretrievable commitment of fossil fuels (diesel and gasoline), oils, and lubricants used by heavy equipment and vehicles. The proposed projects would result in the unavoidable harm or harassment to some wildlife. The Service would implement best management practices to minimize potential impacts.

4.9 Table 1 – Summary of Environmental Effects by Alternative

Environmental Resource	Alternative A: No Action Alternative	Alternative B: Proposed Action Alternative
Impacts to Air Quality	a, b, c, e, f, g - no effect d – long-term adverse (airborne particulates)	a, b, c, d, e, f, g - minimal effects during implementation of projects
Impacts to Water Quality and Quantity	a - no effect b - no short-term; long term adverse (less seasonal and perennial waters, continued altered drainage) c - no short-term; long term adverse (increased sedimentation and turbidity, loss of water storage capacity, risk of downstream contamination) d - no short-term; long term adverse (increased sedimentation and turbidity) e - no short-term; long-term continued sedimentation into wetlands and streams f - no short-term; long term adverse (loss of moist soil habitat, decreased fish habitat) g - no short-term; long term adverse (increased sedimentation and turbidity, loss of water storage capacity)	a – no short-term; long-term beneficial (recharge ground water) b - no short-term; long-term beneficial (increase amount of available water for fish and other wildlife), stabilize vegetative communities c - no short-term; long-term beneficial (reduce sediment loads in stream channels, increase water storage capacity near surface) d - no short-term; long-term beneficial (decrease sediment load in stream channels) e - no short-term; long-term beneficial, reduction sediments into wetlands and streams f - no short-term; long-term beneficial (increase available water for habitat for spring snail and listed fish species) g - no short-term; long-term beneficial (reduce sediment loads in stream channels, increase water storage capacity near surface)
Impacts to Soils	a - no effect b – short-term no effect; long-term adverse (loss of topsoil)	a - short term adverse (disturbance of soils during construction); long term beneficial (increased sediment retention and soil stability) b - short term adverse (disturbance/removal of soils for construction); long term beneficial (top soil retention)

Impacts to Soils	<p>c - no short term; long term adverse (loss of top soil through erosion, loss of stream bed material to erosion, risk of contamination from upstream)</p> <p>d - no short term; long term adverse (loss of hydric soils)</p> <p>e - no effect</p> <p>f – short-term no effect; long-term adverse (altered soil chemistry)</p> <p>g - no short-term; long-term adverse (loss of streambed material, destabilization of riparian soils)</p>	<p>c - short term adverse (disturbance of soil during construction); long term beneficial (retain more soil and nutrients, reduce loss of soil to erosion)</p> <p>d - short term adverse (disturbance of soil around work sites); long term beneficial (hydric soil retention)</p> <p>e - short term adverse (soil disturbance for access roads and drill sites); long term (improve soil chemistry and increase soil retention)</p> <p>f – short-term adverse (disturbance to soil during drilling and running plumbing); long-term beneficial (maintain soil chemistry)</p> <p>g - short term adverse (disturbance of soil during construction); long term beneficial (retain more soil and nutrients, reduce loss of soil to erosion)</p>
Impacts to Habitat	<p>a - no short term; long term no effect</p> <p>b - no short term; long term adverse (loss of grassland habitat, increase in invasive plants degrading native habitat, less available aquatic habitat)</p> <p>c - no short term; long term adverse (cumulative loss of soils for native plant population growth, decrease water quality for fish habitat)</p>	<p>a - short term adverse (degradation during construction); long term beneficial (increased habitat by increasing surface water retention, retain soil for plant growth)</p> <p>b - short term adverse (degradation of habitat for some reptile, avian, and arthropods during construction); long term beneficial (increased available habitat for listed fish and other wildlife)</p> <p>c - short term adverse (degradation of habitat during construction); long term beneficial (increased sediment retention in stream beds = increase in ground water = increase in fish habitat, increase plant growth)</p>

Impacts to Habitat	<p>d - no short term; long term adverse (cumulative loss of soils and increased sedimentation in streambeds during floods)</p> <p>e - no short term; long term Impacts to Habitat (decrease in available new habitat or quality of existing habitat)</p> <p>f – short-term and long-term adverse (loss of habitat, unstable habitat)</p> <p>g - no short term; long term adverse (cumulative loss of soils for native plant growth, decrease water quality for downstream fish habitat)</p>	<p>d - short term adverse (disturbance of soil around work sites); long term beneficial (decrease sediment load in stream channels)</p> <p>e - short term adverse (degradation of habitat during drilling); long term beneficial (increased available habitat)</p> <p>f – short-term adverse (degradation during drilling and plumbing); long-term beneficial (maintain habitat, stabilize habitat)</p> <p>g - short term adverse (degradation of habitat during construction); long term beneficial (increased sediment retention in stream beds = increase in ground water = increase in downstream fish habitat)</p>
Impacts to Wildlife	<p>a - no short term; long term beneficial and adverse (possible for native fish species to pioneer upstream from Mexico; possible for non native species to pioneer upstream from Mexico)</p> <p>b, c, d, e, f, g – no short-term; long-term adverse (decline in wildlife populations due to decline of habitat)</p> <p>c - no short term; long term adverse (decreased habitat and available water)</p> <p>d - no short term; long term adverse (decreased habitat quality due to increased sedimentation in streams)</p>	<p>a - short term adverse (harassment and possible harm to wildlife during construction); long term beneficial and adverse (prohibits movement upstream of nonnative fish species; prohibits natural movement upstream of native fish species)</p> <p>b - short term adverse (degradation of available habitat during construction, harassment and possible harm to wildlife during construction); long term beneficial (increased available habitat)</p> <p>c - short term adverse (habitat degradation, harassment and possible harm to some wildlife); long term beneficial (increase habitat and available water)</p> <p>d - short term adverse (harassment and possible harm to wildlife during construction); long term beneficial (increased quality of habitat for wildlife)</p>

Impacts to Wildlife	<p>e - no short term; long term adverse (decreased habitat quantity and quality)</p> <p>f – short-term and long-term adverse (decline of populations)</p> <p>g - no short term; long term adverse (decreased habitat and available water)</p>	<p>e - short term adverse (harassment and possible harm to wildlife during drilling); long term beneficial (increase in available habitat for wildlife)</p> <p>f – short-term adverse (disturbance during drilling and plumbing); long-term beneficial (stabilized/increasing populations)</p> <p>g - short term adverse (habitat degradation, harassment and possible harm to some wildlife); long term beneficial (increase habitat and available water)</p>
Impacts to Threatened and Endangered Species	<p>a - no short-term; long-term adverse (competition with non-native species, loss of habitat)</p> <p>b - no short term; long term adverse (loss of habitat quality and quantity)</p> <p>c - no short term; long term adverse (loss of habitat quality and quantity)</p> <p>d - no short term; long term adverse (decrease in habitat quality)</p> <p>e - no short term; long term adverse (loss of spring snail habitat, decrease in quality and quantity of listed fish species habitat)</p> <p>f – short-term and long-term adverse (decline of populations)</p> <p>g - no short term; long term adverse (loss of habitat quality and quantity)</p>	<p>a - no short-term; long-term beneficial (decreased genetic diversity of listed species from loss of interaction with Mexico populations)</p> <p>b - no short term; long term beneficial (increase amount of available habitat for listed species)</p> <p>c - no short term; long term beneficial (increase in habitat quality and quantity)</p> <p>d - no short term; long term beneficial (increase in habitat quality)</p> <p>e - no short term; long term beneficial (restore spring snail habitat; increase quality and available habitat for listed fish species)</p> <p>f – no short-term; long-term beneficial (stabilized/increasing populations)</p> <p>g - no short term; long term beneficial (increase in habitat quality and quantity)</p>
Impacts to Cultural Resources	a, b, c, d, e, f, g - no effect	a, b, c, d, e, f, g- no effect
Impacts on Socioeconomic Resources	a, b, c, d, e, f, g - no short-term; long-term adverse (decreased visitation to refuge and tourism dollars spent in local communities by refuge visitors)	a, b, c, d, e, f, g - short-term beneficial (create local jobs, increased revenue for local communities); long-term beneficial (increased refuge visitation, increased tourism dollars for local communities)

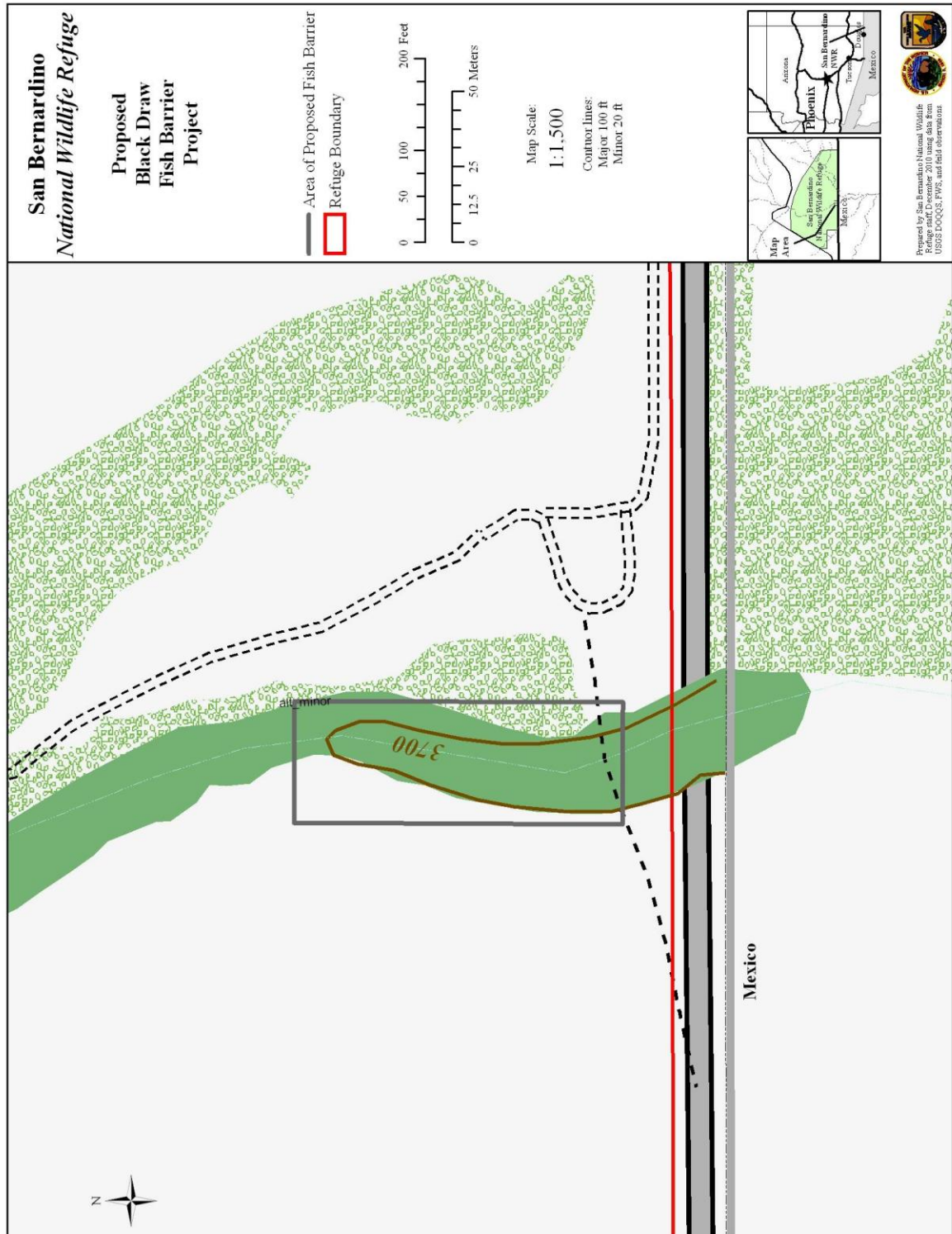
Impacts on Aesthetic and Visual Resources	a, b, c, d, e, f, g - no short-term; long-term adverse (habitat degradation; decrease in resident wildlife)	a, b, c, d, e, f, g - short-term adverse (loss of landscape integrity, decrease in wildlife viewing opportunities); long-term beneficial (restoration of habitat, increase in wildlife viewing opportunities)
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5.0 CONSULTATION, COORDINATION, AND DOCUMENT PREPARATION

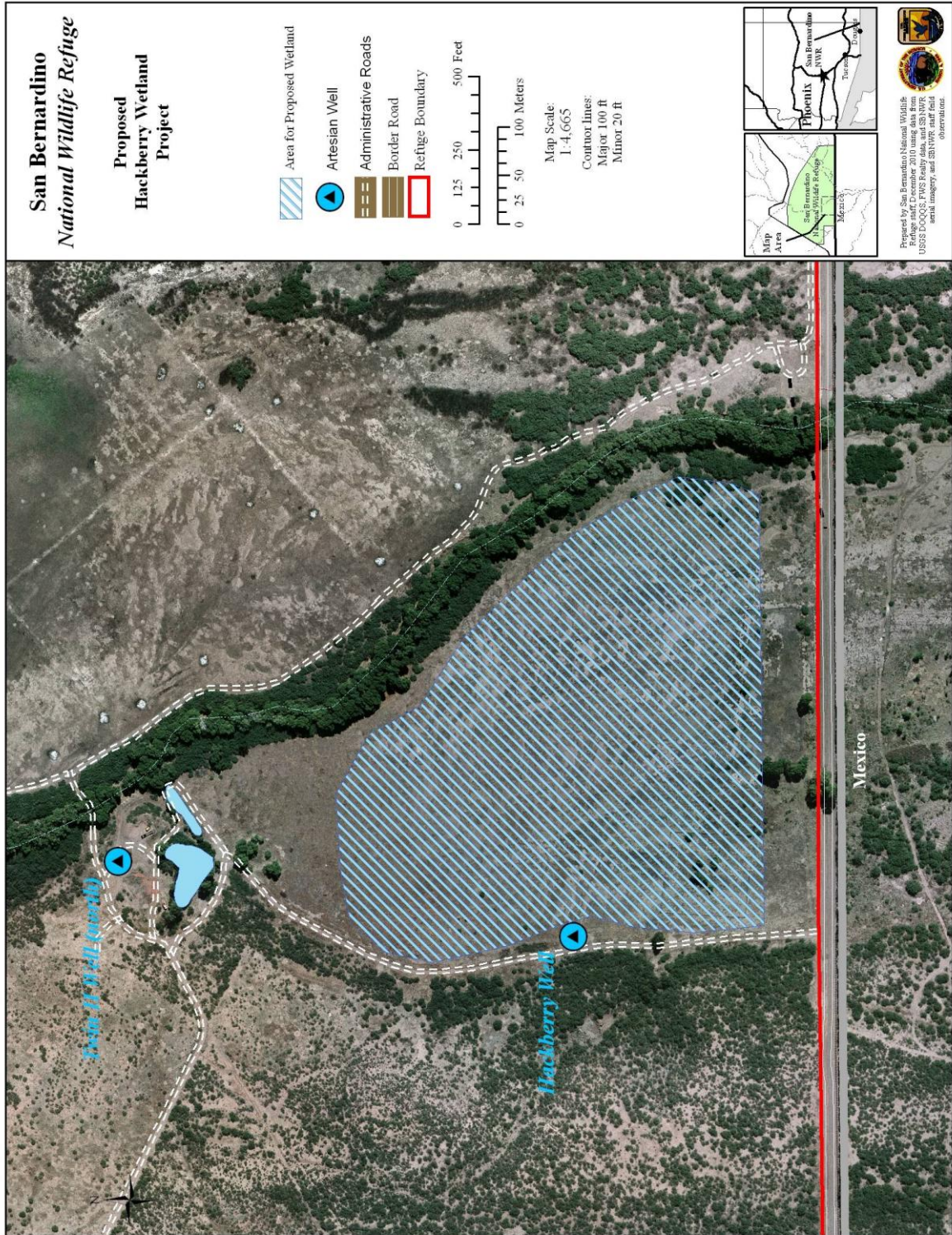
This document was prepared by Refuge Staff, San Bernardino National Wildlife Refuge, U.S. Fish and Wildlife Service, Douglas, Arizona; with input from Carol Torrez, U.S. Fish and Wildlife Service, Albuquerque, NM; and Bureau of Land Management Safford Field Office staff.

APPENDIX - PROJECT MAPS

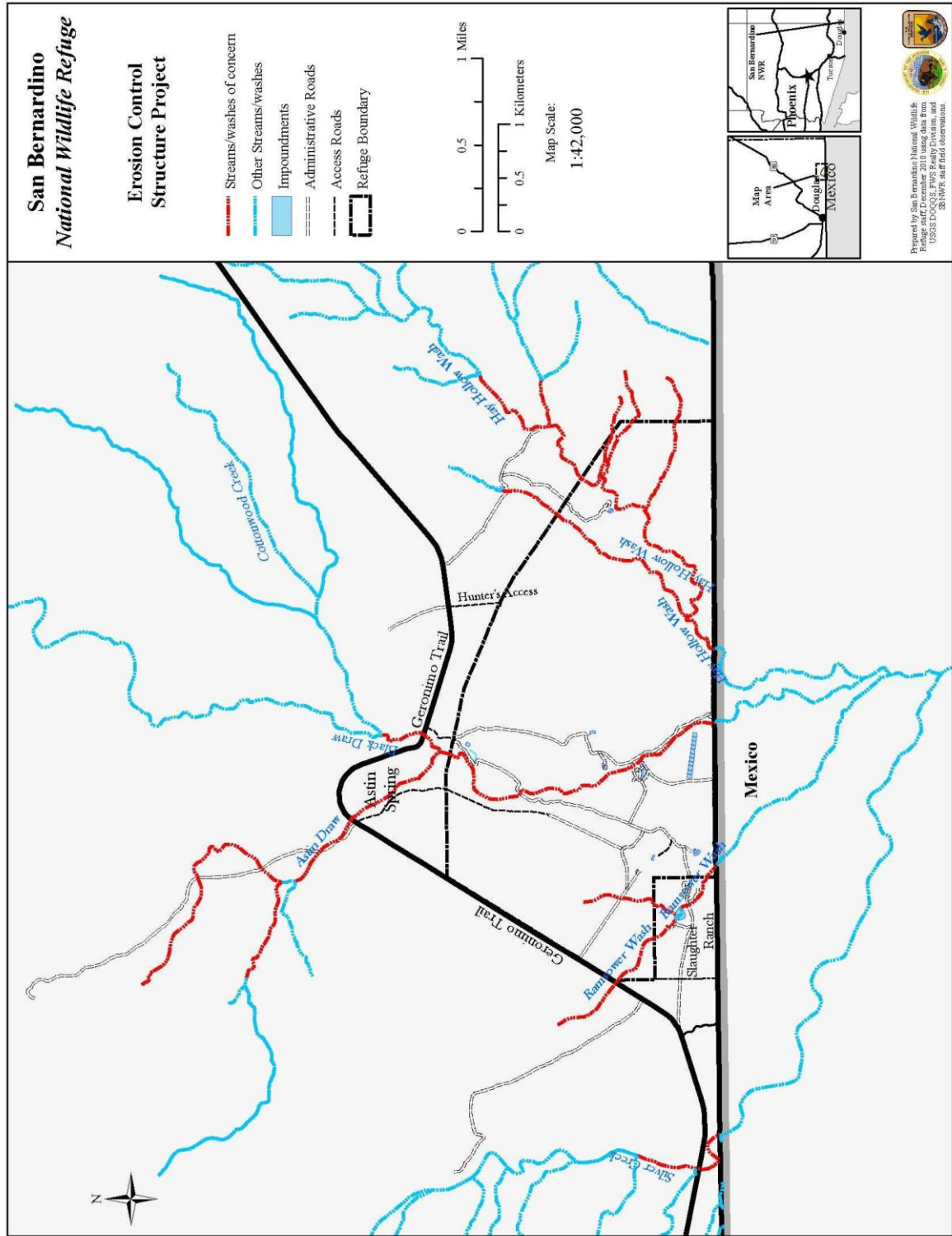
a. Fish Barrier



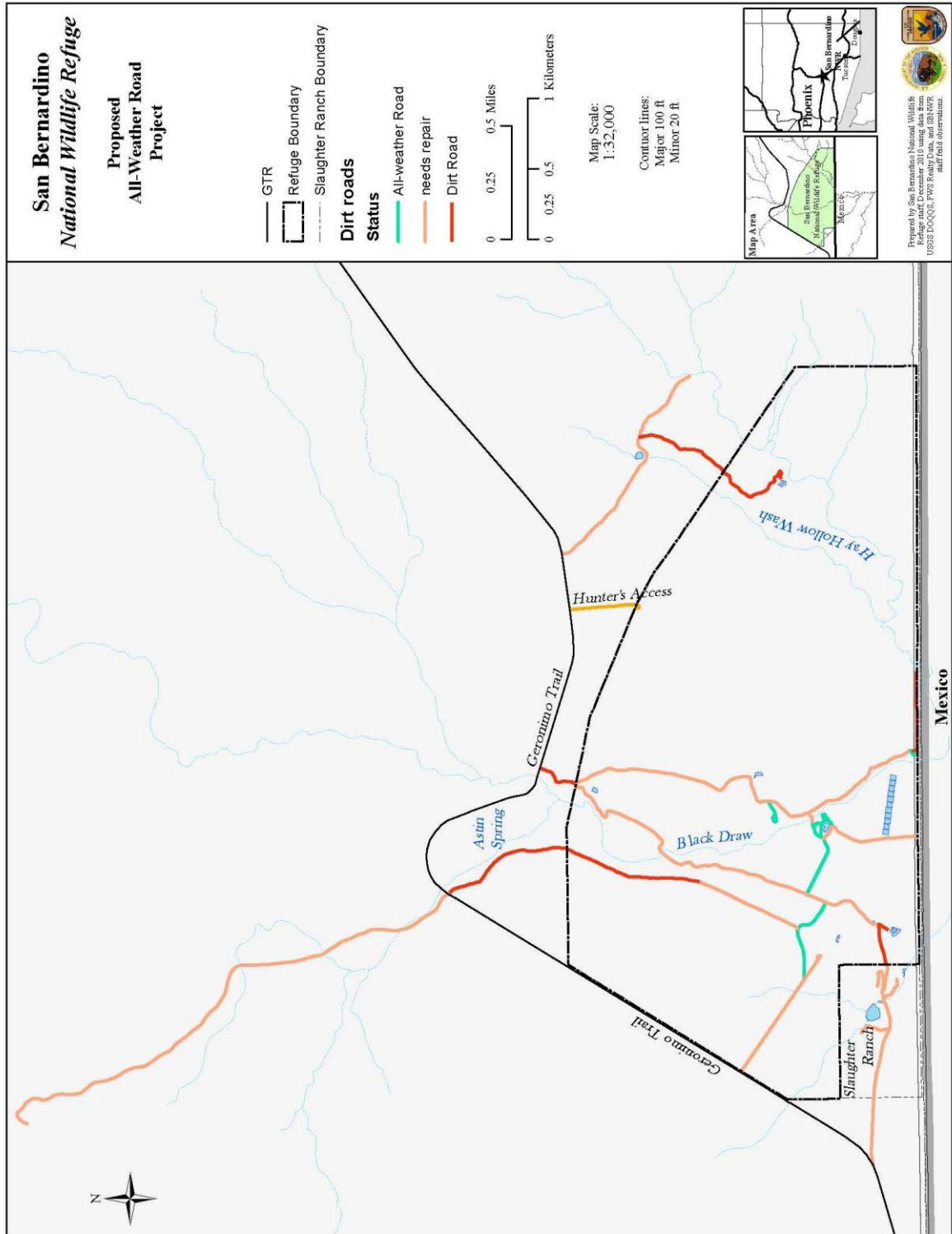
b. Wetland Restoration



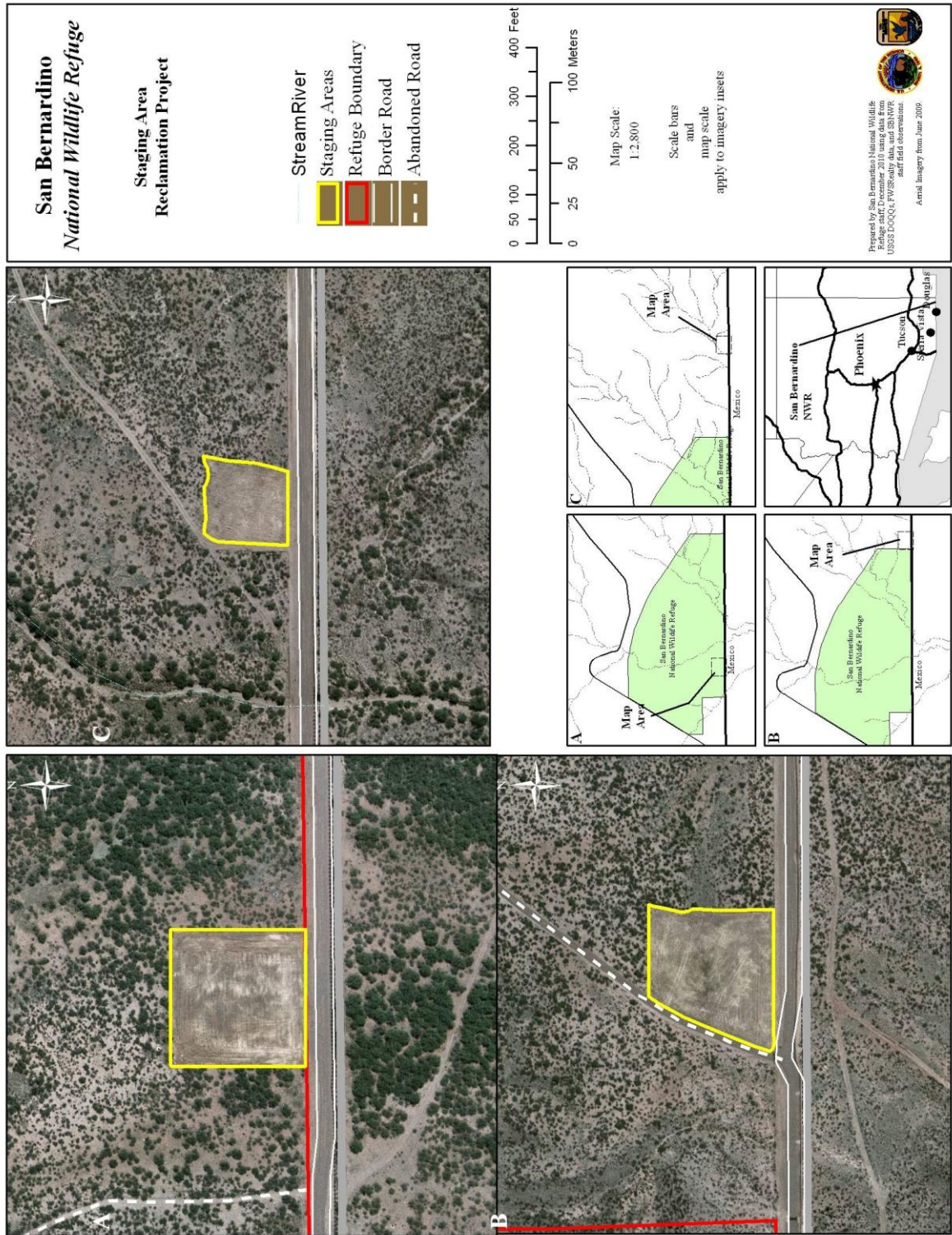
c. Erosion Control Measures



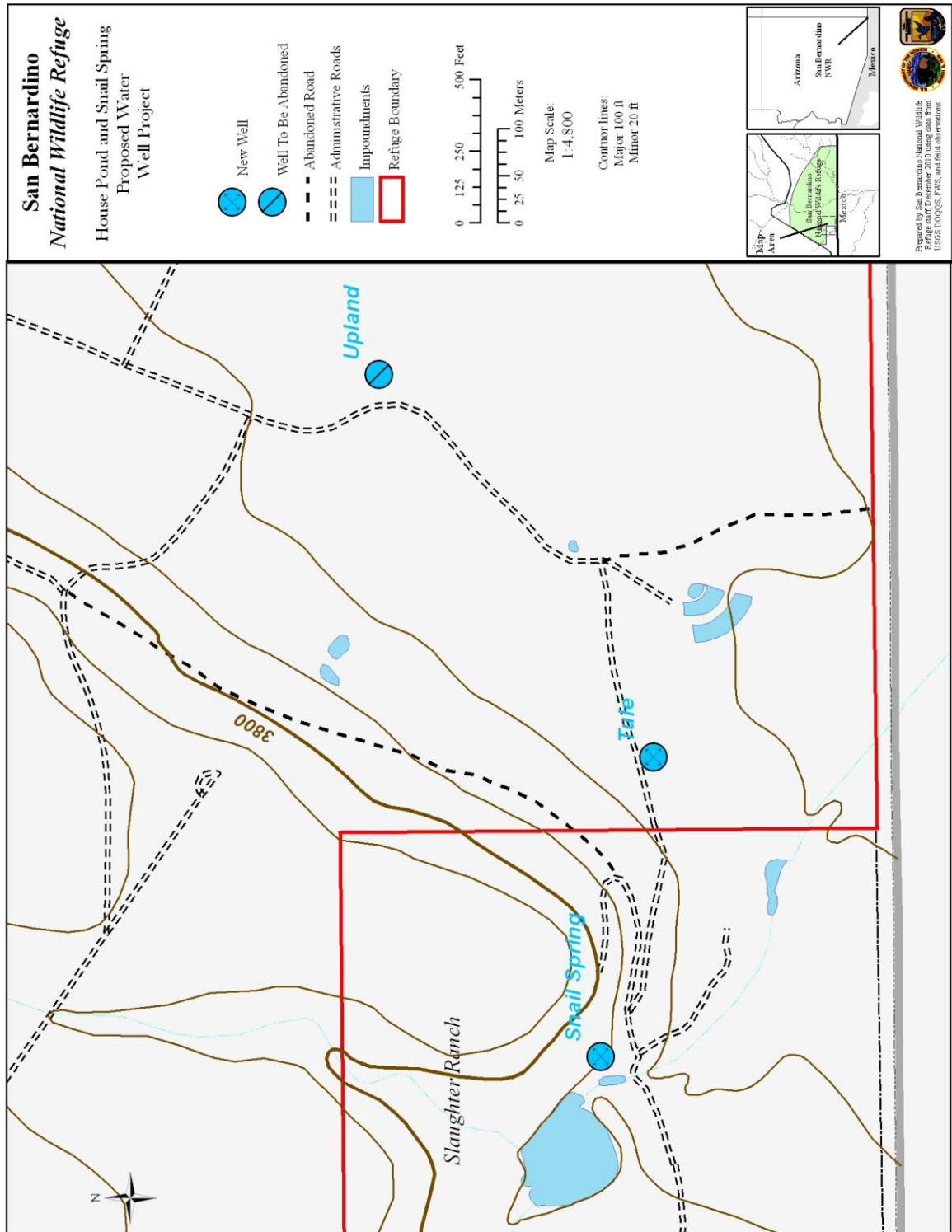
d. All-weather Roads



e. Staging Area Reclamation



f. Water Wells



g. Off Refuge Erosion Control Measures

